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THE BOUSH CREEK DRAINAGE PROBLEM AT NORFOLK, VIRGINIA

By PERRY W. RUTH, Chief of Bureau
Mosquito Control, Norfolk, Virginia

Before the war Boush Creek was a tidal marsh many acres in extent which served as the natural drainage basin for an area of more than two square miles. Its broad outlet opened toward the north to tide water and several miles of various width ditches had been cut in its mucky flats under the direction of the Norfolk Bureau of Mosquito Control to eliminate the prolific breeding of *Aedes sollicitans* and *A. taeniorhynchus*.

In 1940 construction on the great new Norfolk Naval Air Base was begun which included extensive hydraulic fill across the mouth of Boush Creek. Many hangars and a network of concrete run-ways were installed there under which an artificial outlet in the form of a 12 foot flume nearly 5000 feet in length was created as a substitute for the natural water way.

Later, spoil from various dredging operations was deposited as hydraulic fill in other sections of the marsh, decreasing the area of the basin while the area of the watershed remained constant. The last of these fills cut off the intake end of the outlet flume except for a by-pass canal which failed to function properly. Im-

Fig. 1. Navy Drainage Project for Elimination of Mosquito Hazard, Boush Creek, Norfolk, Virginia. Placing and driving piling for 1,400 feet of 24 foot canal through an area of hydraulic fill.

poundment of water increased in former upland sections where conditions were favorable for the breeding of *Anopheles quadrimaculatus,* which had already been found. *Aedes sollicitans* appeared in the shrinkage cracks of the extensive hydraulic fills and the potential mosquito hazard in this area of war activities was plainly serious when in the spring of 1944 the situation was taken in hand by the Navy Medical Corps under the direction of Rear Admiral J. J. A. McMullin. Admiral McMullin's ability to grasp and cope with new problems had already been demonstrated in his organization of hospital facilities in Pearl Harbor after the disaster there in 1941 and with the able assistance of Captain J. M. Huff he lost no time in starting corrective measures. Field operations were in charge of Lt. Comdr. A. A. Weathersbee, of our Association, who was later promoted to the rank of Commander in the Pacific theater of operations, and his knowledge and initiative were invaluable in carrying out the work to a successful conclusion.

Temporary relief was the first consideration by the use of larvicide and clearing out growth from the water edge. Permanent elimination of much potential breeding over the hydraulic fill areas was secured by resurfacing, grading and drainage, practically all of which was hand work done by enlisted personnel, although a modified tractor and disc harrow was effective in certain instances.

However, permanent and positive drainage facilities for the basin itself was the major problem which could be solved only by the cooperation of the Public Works and the Medical Department. In order to avail himself of expert advice, Admiral

Fig. 2. Navy Drainage Project for Elimination of Mosquito Hazard, Boush Creek, Norfolk, Virginia. Intake end of 24 foot canal. Two lines of wooden piling will be cut off to carry reinforcements for concrete floor while cross piling near machine will brace wing-wall.

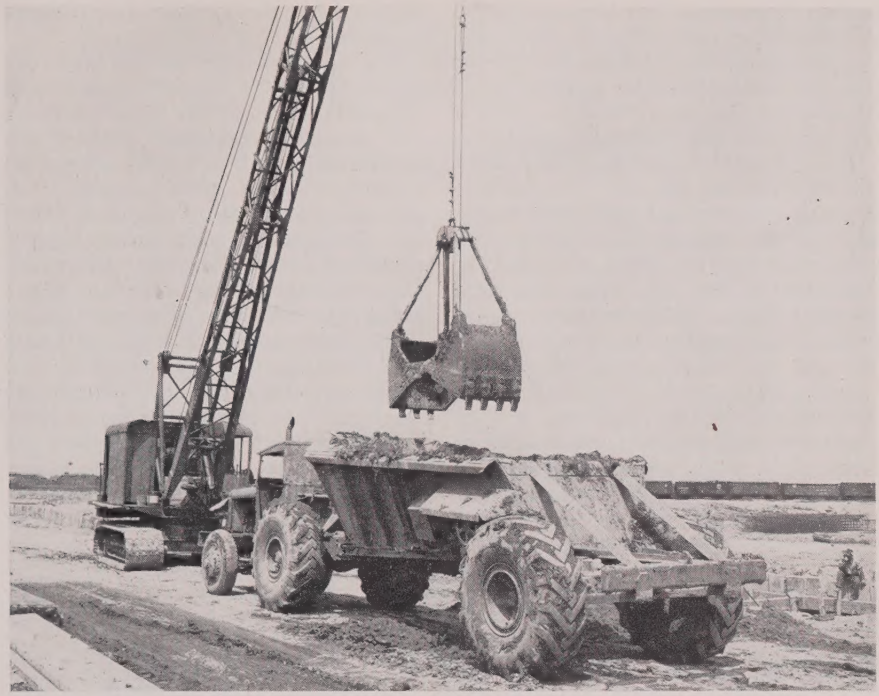


Fig. 3. Navy Drainage Project for Elimination of Mosquito Hazard, Bousch Creek, Norfolk, Virginia. Material between sheet pile walls of canal is excavated by bucket-crane and removed by heavy duty "bottom dump." Concrete floor of canal is then poured to grade and wooden bracing removed.

McMullin laid the matter before the Commandant of this Fifth Naval District with the result that an invitation to act as consultant was sent to Mr. Thomas D. Mulhern, Associate in Mosquito Control with the New Jersey Agricultural Experiment Station and Secretary of our Association. Mr. Mulhern came to Norfolk in August, 1944, and spent several days covering every phase of the situation. He made a very favorable impression on the Navy officials here and his subsequent report to Admiral McMullin was ably written and certainly had a considerable effect on the final plans and specifications accepted by the Navy.

The first phase of the project and the one calling for the greater portion of heavy construction work has just been completed and a good idea of what it entailed may be obtained from the accompanying official Navy photographs taken in May, 1945. This phase contemplated the construction of a 24 foot canal with its floor at the low tide elevation of the outlet flume and extending nearly 1400 feet through hydraulic fill from the upper end of this flume to the area of impounded water above. This was through what had formerly been very unstable marsh and was a difficult engineering task which was carried to a successful completion by the Arundel Corporation of Baltimore.

The side walls of this canal were created by driving parallel lines of continuous tongue-and-groove reinforced concrete sheet piling down through the hydraulic fill into the old marsh floor below, the lines being 24 feet apart. (See cut No. 1) On account of the deep fluid mud overlaying the firm material, it was first necessary to drive the wooden piles which would support the flume bottom, providing sufficient

additional length so that their tops would temporarily project above the marsh and support a template for setting and bracing the two lines of concrete sheet piling, as is shown in cut No. 2 where the canal is emerging into the impounded water area. After the concrete sheeting was in place, the mud between the walls was excavated by bucket and removed with Euclid bottom dump trucks. (See cut No. 3) The wooden piles were then cut off to grade and the reinforced concrete bottom installed in the canal or flume, the timber template and additional timber bracing temporarily supporting the walls against the external pressure of the mud. After the floor was poured and set, the timbering was removed, a concrete coping was installed on each of the walls and an open 24 foot canal remained. Piped side openings were left at certain places to care for drainage from various areas brought in by ditches such as the one shown being reconditioned in cut No. 4.

The 1400 foot canal has now been completed and physical connection made with the outlet flume. It has a dual purpose; first to carry off surface drainage and second, to provide a certain amount of reservoir space in storm periods. It has given evidence of performing its functions in a satisfactory manner although much additional work remains to be done. Adequate drainage channels are yet to be provided to the inlet end of the canal through the area that has for so long been flooded and after this work is completed there remains a rather difficult task of removing much silt from the covered flume. However, we feel sure that these objectives will be accomplished and when that is done there is reason to believe that our problem of Boush Creek mosquito breeding will have been permanently solved.

Fig. 4. Navy Drainage Project for Elimination of Mosquito Hazard, Boush Creek, Norfolk, Virginia. Several ditches, like th eone being reconditioned here with a bucket-crane, will carry surface run-off to piped openings in the side walls of the 24 foot canal.

ANOPHELES AND MALARIA IN THE NORTHWESTERN STATES

C. M. GJULLIN AND W. W. YATES, U.S.D.A., Agr. Res. Adm.,
Bureau of Entomology and Plant Quarantine[1]

Malaria was an important disease in Oregon and Washington during the 19th century. In an analysis of historical data relating to *Anopheles* and malaria in the Pacific Northwest, Stage and Gjullin (5) found that malaria made its first appearance in the Oregon country in 1829 or 1830, that it was probably introduced by early settlers or by sailors and travelers from malarious belts in the United States, and that it was prevalent among both white and Indian populations during the following years. Indians were so severely affected that it was considered an important factor in the decimation of their tribes. The disease was prevalent in these States for many years, but gradually subsided so that by the end of the 19th century there were comparatively few cases.

Malaria is still endemic in the Willamette Valley in Oregon, but in eastern Oregon and in Washington and Idaho there have been few cases in recent years. With the presence of military training camps and the concentration of defense workers in some of these areas, the possibility that epidemics might again occur became an important consideration. Measures designed to deal with this situation were taken by Federal and State agencies. Furthermore, as indicated by Freeborn (2), military personnel returning to this country from malarious areas in other countries and war prisoners employed as agricultural laborers may start malaria epidemics in areas having sufficient *Anopheles* to distribute the disease. In discussing malaria in returning military personnel, Freeborn states, "It is known from experience that the examination of a single blood smear will detect only from 20 to 50 percent of those infected. To hold all returning personnel over a period of 5 to 8 weeks in quarantine with weekly examinations of blood smears would probably result in the detection of perhaps 80 to 85 percent of those infected, but the cost would be terrific and the results problematical." Undetected cases of malaria in returning military personnel or prisoner-of-war laborers may cause an increase of this disease in some areas in the Northwestern States. Any increase will, of course, be dependent on the number of *Anopheles* in this area.

Distribution and Abundance of ANOPHELES

Information on the distribution and abundance of *Anopheles* in the Northwestern States has been accumulated for a number of years in surveys and investigations of this and other genera of mosquitoes occurring in this area. The data have been obtained from larval collections, from hand collections of adults, and from material taken in light traps. In these collections *A. freeborni* Aitken, *A. occidentalis* Dyar and Knab, *A. punctipennis* Say, and *A. pseudopunctipennis franciscanus* McCracken have been taken in Oregon; and *A. freeborni, A. occidentalis,* and *A. punctipennis* in Idaho and Washington. The known distribution of these species in the Northwestern States, as determined from these collections, from records of various collectors as given by King and Bradley (3), and from specimens in the U. S. National Museum, is shown in figure 1.[2]

Anopheles freeborni is the most widely distributed of these species in the North-

[1]The writers wish to thank H. H. Stage and E. F. Knipling for data on *Anopheles* obtained by them during their consecutive periods in charge of the Portland, Oreg., laboratory of the Division of Insects Affecting Man and Animals.

[2]Several locality records for Washington were kindly contributed by M. P. Mondala, of the Washington State Health Department.

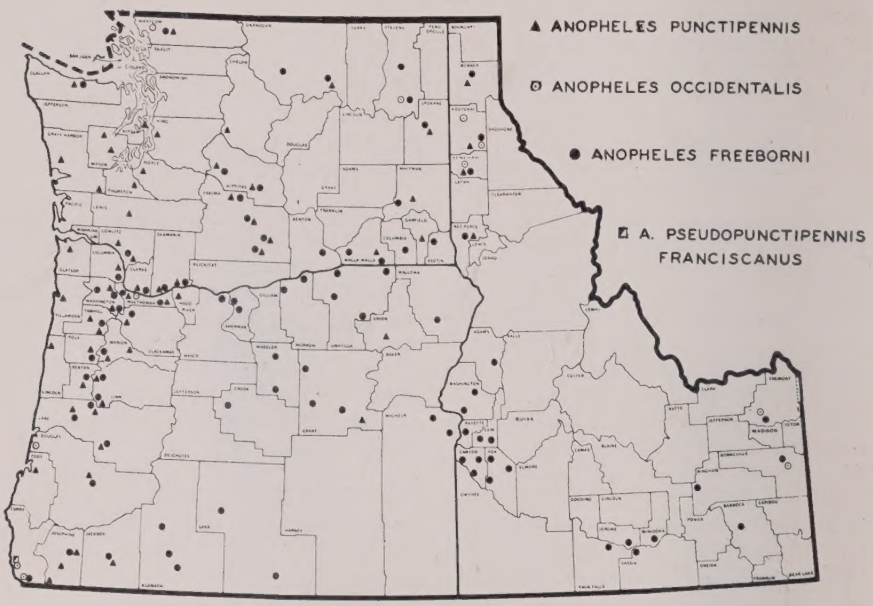


Fig. 1. Known distribution of *Anopheles* in the Northwestern States.

western States. It occurs throughout the entire nonmountainous area wherever suitable breeding places are found. *A. punctipennis* has not been taken in southeastern Oregon or in southern Idaho. In surveys made in 1944 *A. occidentalis* was taken near Reedsport and near the mouth of the Pistol and Windchuck Rivers in Oregon. Specimens were also taken near Cataldo, St. Maries, St. Anthony, Swan Valley, and Coeur d'Alene, Idaho, and near Valley, Wash. There are previous records of this species from Portland, Oreg., Coeur d'Alene, Idaho, and Whatcom Lake, Wash. *A. pseudopunctipennis franciscanus* larvae were taken near the mouth of the Pistol River by the junior author in the summer of 1944. This is the first authentic record of this species in Oregon.

In areas where favorable breeding places are present throughout the summer, *Anopheles freeborni* and *A. punctipennis* are most abundant in August and September. Their abundance from season to season varies considerably with spring and summer weather conditions.

Collections obtained with New Jersey light traps show that *Anopheles punctipennis* is the predominating species in the Willamette Valley in Oregon, and that *A. freeborni* is the predominating species in Yakima Valley, Wash. The traps were operated for an average of from 2 to 3 months a year. In Oregon they were operated near Portland, Tualatin, Peoria, Junction City, Harrisburg, Elmira, and Cottage Grove Dam, and on Grand Island. In some of these places traps were operated for more than a year, so that records from 21 traps are available for the Willamette Valley during the period 1932-1944. Of the *Anopheles* females taken in these traps 80 percent were *A. punctipennis* and 20 percent were *A. freeborni*. In 16 of these trap collections *A. punctipennis* predominated.

In the Yakima Valley, traps were operated near Moxee City, Buena, Union Gap, Yakima, Selah, Wiley, and Naches in 1941, and near Buena, Yakima, Naches, Moxee City, and Sunnyside in 1942. In the 2-year period 90 percent of the females

taken in these traps were *Anopheles freeborni,* and 10 percent were *A. punctipennis.* In all these localities *A. freeborni* was the predominating species.

The average weekly catch of females for the Yakima Valley area was 3.93 *Anopheles freeborni* and 0.42 *A. punctipennis,* as compared with 0.45 *A. freeborni* and 1.9 *A. punctipennis* in the Williamette Valley.

Records obtained from traps operated between the Willamette River and Scappoose, Oreg., in 1941 and 1942 show that the average weekly catch of females for the 2-year period, 29.6 for *Anopheles freeborni* and 11.7 for *A. punctipennis,* is higher than for any other area in which traps have been operated in the Northwestern States. In the first 10 days of August 1941, a trap collected an average of 52 *Anopheles* females per night. The large number collected may have been due to favorable weather conditions and to the excellent breeding conditions which have been created here by diking to keep out the waters of the Willamette River. In the drainage ditches, and in the spring- and seepage-fed sloughs behind this dike, larvae of the two species develop in large numbers.

Anopheles mosquitoes are present in comparatively large numbers in several other areas in the Northwestern States. Higher than average populations have been found in Prineville and Klamath Agency, Oreg. Collections made in Idaho indicate that larger than average numbers may also occur in some irrigated sections in the lower Boise and Payette River Valleys.

In Prineville *Anopheles freeborni* were found to breed in large numbers in pools and sloughs formed by the waters of Ochoco Creek. They were also found along the margins of this creek, and in favorable places along the margin of Crooked River where it borders Prineville. On an average six *A. freeborni* females were taken in six 10-minute collections in the city park about dusk on July 25, 1936. The females were taken with a chloroform tube, while they were attempting to bite the collector. This species apparently attacks outdoors only on warm still nights, for no adults have been seen on slightly cooler evenings in subsequent years.

In a 10-minute collection made in Klamath Agency at dusk in June 1941, nine *Anopheles freeborni* females were also collected while attempting to bite. Larger numbers might be expected to develop here later in the season, since *Anopheles* do not usually reach a population peak until late summer. A large marsh and irrigated pastures provide breeding places in this area.

Many favorable breeding places exist in the Willamette Valley, where the largest number of malaria cases occur. Here the larvae develop in ponds and sloughs, which are filled by overflow or seepage from the Willamette River, and occasionally along the river itself where there are sloping banks and vegetation. They also develop in such situations along the creeks and rivers in the Valley, which empty into the Willamette River. A few are found in other miscellaneous places. In the Yakima Valley all breeding places, with the exception of those along a few creeks, are caused by irrigation water.

In sections of the Northwestern States where *Anopheles freeborni* and *A. punctipennis* are both present, the larvae are often found together. They have been taken along the margins of rivers, creeks, and irrigation ditches, and in ponds, sloughs, gravel pits, and roadside ditches. *A. pseudopunctipennis franciscanus* larvae have been taken with *A. occidentalis.* The latter species has also been found with *A. freeborni.*

Near Sherwood, Oreg., about 100 second and third instars of *Anopheles punctipennis* were taken in two 50-gallon wooden barrels two-thirds full of water, which were standing next to a building. Larvae of this species were also taken by Reeves (personal communication, 1944) in a barrel near Buena, Wash. While the selection of this type of breeding place may represent a tendency of the species to adapt itself to breeding in artificial containers,

the tendency is probably not sufficiently developed to be of importance at the present time.

In Yakima Valley, large numbers of *Anopheles freeborni* and *A. punctipennis* have been found in daylight resting places in semi-open buildings. In the fall most of the mosquitoes move to root cellars, which are present throughout the Valley. In the warmer winter climate in the Williamette Valley they are usually found hibernating in barns and in other partly open buildings.

Status of malaria in Northwestern States

Washington.—Thirty-four cases of malaria were reported to the Washington State Department of Health during the period 1935-44. Most of these cases occurred in the western half of the State. Information was not available on all cases, but in only one instance did the history indicate that the individual contracted the infection in the State. In this case the infection was acquired near Kettle Falls in August 1942.

Idaho.—In Idaho, where malaria has been reported to the State health officer on a voluntary basis since 1936, 20 cases have been reported. Ada, Valley, Twin Falls, Kootenai, Boundary, and Canyon Counties have each reported one case during this period, whereas Nez Perce and Boise Counties have reported seven cases each. The reports do not state whether the patient contracted the disease in the State or elsewhere.

Oregon.—Malaria is still endemic in the Williamette Valley and, although there have been comparatively few cases during the present century, the possibility that it can again become prevalent was shown by the occurrence of 41 cases among 24 families in a school district in Benton and Lane Counties in 1931 (Stage and Gjullin 5). This outbreak was thought to be due to the migration of more than 100 Oklahomans into this area. Malaria has also been prevalent on Grand Island in Yamhill County during the last few years. In 1941 the people of the Island requested assistance from Federal and State agencies in dealing with the problem. Seasonal workers who came in to harvest the crops were apparently responsible for dissemination of the disease among the residents. *Anopheles freeborni* and *A. punctipennis* are present in these areas, and favorable breeding places are comparatively numerous.

Anopheles freeborni is known to be an important vector of malaria, whereas *A. punctipennis,* which was found to be more than twice as numerous as *A. freeborni* in light-trap collections made in the Williamette Valley, is believed to carry very little malaria in nature. Experimental transmission of *Plasmodium vivax, P. falciparum,* and *P. malariae* by *A. punctipennis* has been demonstrated by several investigators. There is only one doubtful record of an infected *A. punctipennis* being taken in nature, but present data cannot be considered conclusive. Simmons and Aitken (*4*), who have summarized available information on the ability of *Anopheles* to transmit malaria, state that further studies of *A. punctipennis* "will be required to determine more exactly its relative importance in the different regions where it exists."

A total of 578 cases of malaria, exclusive of those having histories of recurrence or infection from outside the State, has been reported to the State health officer since 1918, the first year that reports on the disease were required. Although Stage and Gjullin found 41 authentic cases of malaria in a school district in Lane and Benton Counties in 1931, only 9 cases were reported to the State health officer from these 2 counties during that year. This discrepancy between the actual numbers and the numbers reported is probably typical of other areas in the State, and is due to the fact that a considerable number of these people do not have a physician, and that physicians are sometimes lax in reporting cases. Boyd (*1,* p. 132) states that in southeastern Missouri a doctor had been consulted in less than 40 percent of the cases studied. Since irregularities of this nature might vary in different years, and since no cases occurred in some counties in Oregon in some years, the number and distribution of cases in this State can be

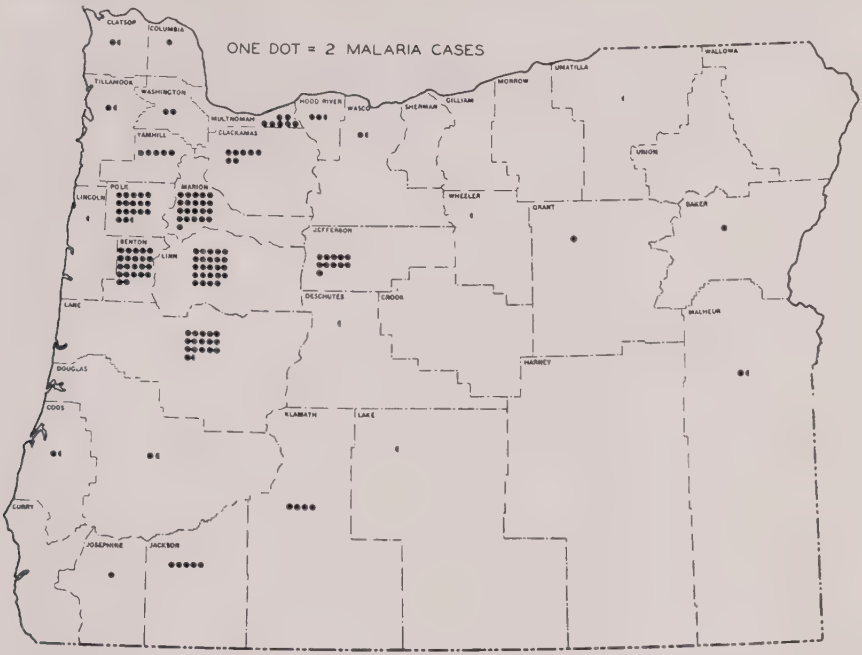


Fig. 2. Distribution of malaria cases in Oregon by counties as reported to the State health officer for the period 1935-44, exclusive of cases having histories of recurrence or infection from outside the State. Distribution within counties is not shown.

more clearly shown from reports for a series of years. The distribution of cases for the period 1935-44 is shown in figure 2. Cases for which no histories of infection are available have been included in this figure. A number of them may have contracted the infection outside of the State.

Only a limited amount of control work against *Anopheles* has been done in the Northwestern States. This work was done by the Oregon State Health Department and the U. S. Public Health Service on Grand Island in 1942, by the Malaria in War Areas branch of the U. S. Public Health Service and military personnel in the vicinity of Camp Adair in 1943-44 and in the vicinity of Camp White in 1944, and by personnel of the U. S. Veterans Hospital on the hospital grounds near Walla Walla, Wash., in 1943-44. The Portland City-County Control District also continued their pest-control program during August 1944 to control *Anopheles* in that area.

Irrigation of a million acres of land in western Washington from the waters impounded by the Grand Coulee Dam is planned, and will undoubtedly create mosquito breeding places throughout this area. How large the *Anopheles* population might become, and how much malaria might develop in the area, it is difficult to estimate, but breeding places would probably not be more numerous or extensive than in the Yakima Valley, which has been irrigated for many years. In this Valley *A. freeborni,* which is considered to be an excellent vector of malaria, is present in larger numbers than the combined populations of *A. punctipennis* and *A. freeborni* in the Williamette Valley, where malaria is prevalent. Many transients come to the Yakima Valley each year to harvest crops, and no doubt a num-

Fig. 3. Locations of proposed irrigation projects in Williamette Valley, Oreg.

ber of them come from other malarious sections of the country. The relatively few cases of malaria that occur in the Yakima Valley under these conditions would indicate that it probably would not become a serious problem in the new area that is to be irrigated.

A number of irrigation projects are also planned for the Williamette Valley. The locations of these projects, which would include a maximum of 355,000 acres, are shown in figure 3. In this area, where malaria is endemic and where warmer winter temperatures probably permit overwintering of the malaria parasite in the hibernating mosquito in most instances, the creation of additional breeding places might be expected to cause more malaria.

Summary

Undetected cases of malaria among military personnel returning to the Northwestern States, and prisoner-of-war agricultural laborers employed there may cause an increase of malaria in areas where sufficient *Anopheles* mosquitoes are present to spread the disease.

The distribution of *Anopheles freeborni, A. occidentalis,* and *A. punctipennis* in Washington and Idaho, and also of these species and *A. pseudopunctipennis franciscanus* in Oregon, is given from material obtained in collections and from locality records of other collectors.

Trap collections show that *Anopheles* species are more numerous in the Yakima Valley in Washington than in the Williamette Valley in Oregon. *A. freeborni* is the predominating species in the former, and *A. punctipennis* in the latter.

Larger populations of *Anopheles* have been found in Prineville and Klamath Agency and near Scappoose, Oreg., than have been found in other parts of the State.

The relatively few cases of malaria that occur in the irrigated Yakima Valley, in spite of a fairly large *Anopheles* population and a yearly influx of harvesters, some of whom may be malaria carriers, indicate that the disease may not be a serious problem in western Washington where a million acres of land are to be irrigated from the waters impounded by the Grand Coulee Dam.

Malaria is still endemic in the Willamette Valley, and may be expected to become more prevalent when proposed irrigation projects totaling 355,000 acres are completed in that area.

Literature Cited

(1) Boyd, M. F. 1930. An introduction to malariology. 437 pp., illus. Cambridge, Mass.

(2) Freeborn, S. B. 1944. Problems created by returning malaria carriers. U. S. Pub. Health Serv. Rpts. 59:357-363.

(3) King, W. V., and Bradley, G. H. 1941. Distribution of the Nearctic species of *Anopheles*. *In* A symposium on human malaria, edited by F. R. Moulton, Amer. Assoc. Adv. Sci., Pub. 15, pp. 71-78, Washington, D. C.

(4) Simmons, J. S., and Aitken, T. H. G. 1942. The anopheline mosquitoes of the northern half of the Western Hemisphere and of the Philippine Islands. Army Medical Bul. 59, pp. 26-27.

(5) Stage, H. H., and Gjullin, C. M. 1935. Anophelines and malaria in the Pacific Northwest. Northwest Sci. 9 (3):5-11.

SOME INTER-COUNTY MOSQUITO CONTROL OPERATIONS SHOWING EQUIPMENT USED IN IMPROVEMENT OF THE UPPER PASSAIC RIVER CHANNEL IN ESSEX AND MORRIS COUNTIES, NEW JERSEY

By R. L. VANNOTE, Superintendent
Morris County (N. J.) Mosquito Extermination Association
AND
G. W. EAGER, Superintendent-Secretary
Essex County (N. J.) Mosquito Extermination Association

The upper Passaic River valley, situated only fifteen miles from the center of Newark, and extending from Millington to Little Falls, is one of the great fresh water mosquito breeding areas in New Jersey. Following periods of heavy or prolonged rainfall, 32,000 acres of swamp and meadow lands flood and produce great

Fig. 1. A specially designed, sectional dredge-boat used in inter-county, mosquito control improvement of the upper Passaic River.

A 10-inch, cutter-type hydraulic dredge of 540 cubic yards daily capaciyt. Specially built in demountable sections for convenient passage under bridges and through narrow spaces between bridge piers. Cost $20,000.

Fig. 2. The Passaic River dredge cutting through the neck of a meander.

Fig. 3. A close up view from the rear.

Fig. 4. The dredge and spoil-pipe assembly from the rear.

Fig. 5. A ¾ yard drag-line bucket operating from a caterpillar crane equipped with a 40 foot boom.

broods of Aedes vexans and Aedes trivittatus which migrate as far as ten miles, affecting a population of one and a quarter million people residing in four counties.

To overcome this summertime scourge, the County Mosquito Commissions of Essex, Morris, Union and Passaic organized an intercounty committee for the purpose of preparing plans leading to the control of mosquito breeding in the area. Operating with funds supplied by the Essex and Morris County Commissions, dredging equipment has been purchased and built and to date some ten miles of river channel have been dredged to increase the run-off of flood waters. Minor floods now drain from the meadows prior to brood emergence and as the work progresses, greater benefits will result.

Fig. 6. A ½ yard clam-shell bucket operating from a 40 foot boom mounted on a scow.

THE OCCURRENCE OF *ORTHOPODOMYIA ALBA* BAKER AT NEW ORLEANS, LOUISIANA

By P. H. HARDEN, P. A. Sanitarian (R)
U. S. Public Health Service, Louisiana State Board of Health, New Orleans, La.

Two larvae of *Orthopodomyia alba* Baker and one larva of *Culiseta melanura* (Coq.) were found on August 7, 1944 in an outside flower pot partially filled with debris and decaying leaves in the vicinity of Audubon Park, New Orleans, Louisiana.

Subsequent search in Audubon Park revealed several tree-holes containing water. In one of these on August 10, 1944 were found other larval specimens of *O. alba*. Some of these were reared, emerging about the middle of September, 1944. Other specimens of this species were obtained from tree-holes in Audubon Park during September and October, 1944, some being early instar larvae. These remained alive in the rearing jars during the winter, and adults emerged from them during the period of February 24, 1945, through March 30, 1945. The larvae were kept during this time in a small building which was unheated except for short periods on the coldest days.

Another collection of early instar larvae was made on May 30, 1945; all of these, which developed into mature larvae, proved to be *O. alba* and emerged July 14-17, 1945. The tree from which this collection was made was a pecan, *Hicoria pecan*.

New Orleans, Louisiana, is, to the writer's knowledge, the southernmost locality from which *O. alba* has been collected.

LABOR VS. MECHANIZED EQUIPMENT IN MOSQUITO CONTROL WORK. SHIFTING EMPHASIS IN ALAMEDA COUNTY (CALIFORNIA) MOSQUITO ABATEMENT DISTRICT

By HAROLD F. GRAY, Engineer and Executive Officer
Alameda County Mosquito Abatement District

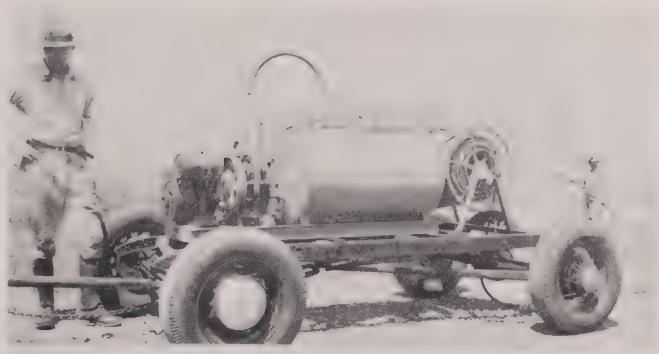
Some mosquito control agencies have adopted a policy of considerable use of mechanized equipment, while many others have tended to use relatively little mechanized equipment. Usually these differences in policy are related to such local factors as type of terrain, wage rates, labor availability, and size of district. The present trend, on account of increasing wage rates, is generally toward increasing mechanization and the development or adaptation of new power devices.

The Alameda County (California) Mosquito Abatement District has adopted an intermediate position in the past, but at present intends to acquire a considerable number of power units as soon as available. Among the items under consideration for acquisition within the next year are:

1. A ½ yard wide-tread tractor-mounted crane with clamshell bucket.
2. A "weasel" or similar amphibious vehicle.
3. A helicopter for inspection and spraying of relatively inaccessible areas.
4. A wide-tread "caterpillar" type tractor with ditch cleaning tool.
5. A "flame thrower" for clearing vegatation from drains, creeks, etc.
6. A Chemical Warfare Service type of smoke generator for spraying.
7. A shallow-draft power launch.
8. A power operated chemical mixing plant (for DDT solutions).
9. One or more additional power sprayers.

At present this District is only moder-

Part of Oakland depot (Alameda County, California). Gambusia tank in foreground. Steel warehouse in background.



Bean power sprayer, with Van Pelt hose reel mounted on trailer. (Alameda County, California).

Three inch Jaeger trash pump in operation, pumping out an undrainable area. (Alameda County, California).

Haywood depot (Alameda County, California). Since photograph was taken, the roadway has been paved with concrete.

ately mechanized, for prior to the war it was able to operate under moderate wage scales (labor $140 per month). Increasing wage scales and labor scarcity, plus a large accumulation of deferred maintenance on drainage systems, justifies the proposed capital investment in power equipment.

The District now owns one medium and four light trucks, one three-wheeled compressed air spray rig, one Bean power sprayer mounted on a trailer, one Jaeger 3 inch pump, an Airco welding and cutting outfit, and miscellaneous small equipment. The District also owns three divisional depots, with garage-warehouses at each, and each equipped with showers, lavatory facilities and lockers for the men. Additional land adjacent to one of the depots is to be acquired for storing the new equipment to be purchased. Each depot also has underground storage tanks, with pumps, for Diesel oil and gasoline.

NOTES ON MOSQUITO MIGRATION IN SALT LAKE CITY IN 1945

By DON M. REES, Professor of Zoology and Entomology
University of Utah, Salt Lake City

A migration of *Aedes dorsalis* arrived in Salt Lake City on June 22. In the evening of this date they were present only in the west part of the city and were very annoying to inhabitants of this area. The following evening they were distributed and annoying throughout the city. These migrants were present in the city until about July 3 when they began to disappear, and by July 9 they could no longer be detected.

These mosquitoes were produced in extensive temporary breeding water on the flats west of the city in water arising from excessive precipitation and a resulting increase in irrigation waste water. The migrants flew, before reaching the city, a distance of at least two miles and most of them moved in from much greater distances. Conditions at the time were favorable for a migration of this species, consisting of (1) a concentration of mosquitoes in the breeding areas, and (2) suitable atmospheric conditions of temperature and humidity. In addition a clear full moon was present on the nights when the migration occurred.

This last factor motivates the presentation of these notes for publication. In investigating migrations of *Aedes dorsalis* into Salt Lake City from the marshes west of the city, the author has observed seven major migrations of this type that have taken place since 1931 and all have occurred at the time of a full moon. During this period numerous general dispersals or minor migrations have taken place in this area whenever other conditions were favorable, but all major migrations of *Aedes dorsalis* have taken place at the time of a full moon.

In the opinion of the author this repeated phenomenon is more than a coincidence. These seven major migratory flights of *Aedes dorsalis* have all been from the west towards the east. In each instance the migrants moved in a general easterly direction rather than moving out in all directions as in a general dispersal. The influence of the moon on mosquito migrations, if any, has not been established; but such an influence seems highly probable as the moon is known to affect the movement of certain other animals.

EQUIPMENT DEVELOPED BY DELAWARE STATE HIGHWAY DEPARTMENT FOR MOSQUITO CONTROL WORK

By F. ELWOOD LYNCH, Mosquito Control Engineer
Lewes, Delaware

Fig. 1. The Delaware State Highway Department has found the E-76 Cletrac with built-up treads to reduce ground pressure adaptable to many types of mosquito work on marsh areas. As illustrated it is equipped with a portable 6 gallon per minute "Hardie" spray unit with proper tank filling unit and other accessories. Power for the spray is furnished by the take-off of the tractor instead of a small gasoline engine usually furnished by manufacturer.

Fig. 2. The Massey-Harris four wheel drive with special 12.75 x 24 tires and equipped with a portable 6 gallon per minute "Hardie" spray unit with proper tank filling unit and other accessories. Power for the spray is furnished by the take-off of the tractor instead of a small gasoline engine usually furnished by manufacturer. This type tractor has proven valuable for the treatment of catch basins, low depressions in beach dunes, and highland work.

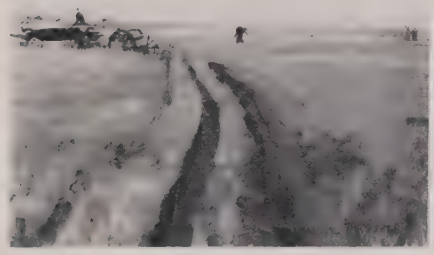


Fig. 3. Photograph illustrates work completed by a special 10″ marsh plow which was developed by the State Highway Department. It is used largely for connecting breeding pools to lateral ditches.

Fig. 4. Arrowhead outlet flume which protects ditch outlets through sandy shores. These type outlets which were developed in Delaware have proven highly satisfactory over the past ten years.

SOME MOSQUITO CONTROL OPERATIONS IN BERGEN COUNTY, NEW JERSEY

By VERNON CONANT, Superintendent
Bergen County Mosquito Extermination Commission

Fig. 1. Hackensack, New Jersey, February, 1942. Power shovel with ½-yard drag-shovel attachment. Clearnig the channel of a brook through a woodland swamp.

Fig. 2. Mulinari Ditch, January, 1943. Power shovel with 7 cubic foot orange peel bucket, cleaning and grading a 5 foot ditch.

Fig. 3. East Riser, New Jersey, January, 1943. Power shovel with ½ yard dragline bucket widerning the channel of a brook from 5 feet to 12 feet for flood control.

Fig. 4. Moonachii Creek, March, 1943. Power shovel with ⅜ yard dragline bucket, cleaning large drainage creek on salt marsh.

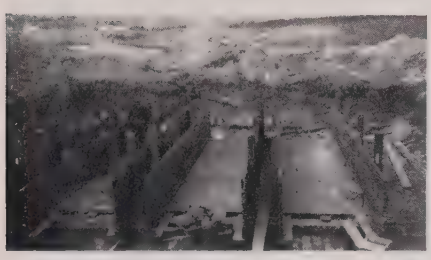


Fig. 5. Tide Gate. Riser, New Jersey, December 12, 1941.

Fig. 6. Tide Gate. Riser, New Jersey, December 19, 1941.

Fig. 7. Tide Gate. Riser, New Jersey, December 26, 1941.

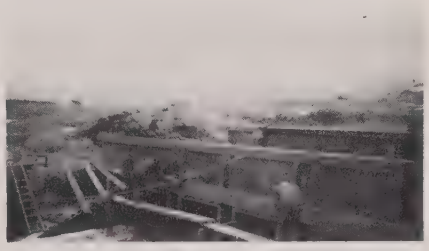


Fig. 8. Tide Gate. Riser, New Jersey, December 31, 1941.

Fig. 9. Tide Gate. Riser, New Jersey, January 12, 1942.

MOBILE DREDGE PUMP FOR MOSQUITO CONTROL

By JOHN V. OSMUN, Captain, SnC, Hq. 2nd Service Command

A useful and economic dredge pump has been developed at Fort Monmouth, N. J., for the excavation of muck bottom in tidal streams. Credit for the idea and construction of the unit belong to Victor Blondek and Captain J. Charles Morgan. The principle involved is that of pumping stream-bed material and water, the mixture of which may be deposited as a back fill along the banks of the stream.

The unit consists of a 4″ centrifugal pump that may be purchased for $375 or less. To this is attached a 15 foot length of 4″ high pressure hose for intake suction and an appropriate length of hose for effluent flow. The power for this pump is furnished by a salvaged Jeep motor (4 cylinder, 60 horsepower). The engine cooling can be conveniently arranged by constant circulation of stream water filtered through an interchangeable glass-wool filter.

Since operation has been designed for dredging a narrow tidal stream, it is mounted on a raft floated on six (6) fifty-five (55) gallon drums. This raft is easily moved along the stream by two or three men. Operational costs involve approximately six (6) gallons of gasoline per day plus nominal upkeep costs on the engine.

Experience has shown that this dredge pump, operated by a three or four man crew, will clean 60-80 lineal feet of channel 8′ wide and 20″ deep in one day. It is estimated that approximately fifteen (15)

Fig. 1. Mobile dredge pump for mosquito control. Showing details of float construction.

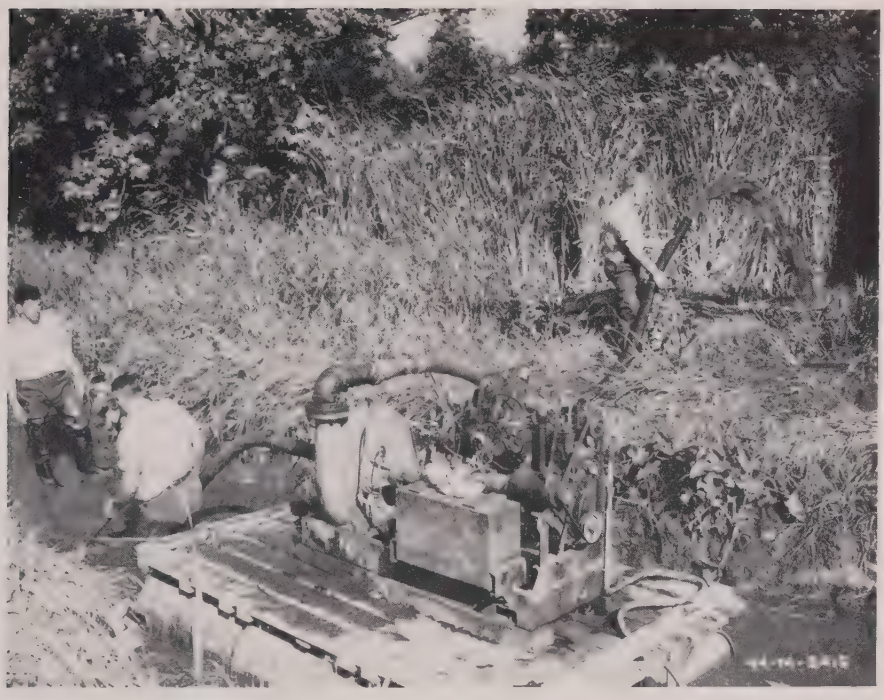


Fig. 2. Mobile dredge pump for mosquito control in operation.

laborers would be needed to accomplish this work by hand. Based on prevailing wages, about $60 is saved per day. At Fort Monmouth, this dredge saved $3000.00 in one year.

This convenient dredge offers the benefits of both removing the stream bottom periodically and giving excellent distribution of back fill. Salt marsh drainage systems can be kept open and in a state of constant flow. The problem of transporting this unit is solved in the ingenuity of assembling the raft according to one's particular needs.

THE DISK HARROW—A VALUABLE ADDITION TO MALARIA CONTROL EQUIPMENT[1]

By LIEUT. WILLIAM J. PERRY H(S) USNR[2]

An important farm implement transported overseas for farming purposes became an indispensable weapon in the hands of Navy and Army malaria control personnel to help eradicate the breeding places of *Anopheles farauti* in the New Hebrides-Solomon Islands.

Throughout the islands of the South Pacific, the important malaria vector chose by preference as its favorite breeding place, the water held in road ruts, hoofprints, small depressions, and ground pools. These sites were particularly favored during periods of prolonged or intermittent rains.

Numerous ruts and depressions, made by troops on tactical maneuvers, were formed in virgin jungle areas and in coconut and coffee groves on Efate and Espiritu Santo in the New Hebrides. Ruts and depressions were numerous throughout the flat lands of the northeast coast of Guadalcanal and in the sandy soils of Bougainville in the upper Solomons. Ruts caused by vehicles carrying ammunition and fuel to storage dumps were particularly common. Miles of new and potential breeding areas were thus produced with the movement of troops in these jungle and cultivated areas.

The packing of soil by vehicle wheels inhibited the normal percolation of standing water and these "man-made" catchments remained as malaria hazards until permanently corrected. Hand filling by natives was practiced for several months until it was demonstrated that a disk-harrow drawn over these rutted areas was time saving and afforded permanent control.

Extensive disking was practiced during periods of semi-dry weather. When the soil is heavily saturated with water, the disk-harrow is not recommended, but it can be operated with ease and little difficulty during the dry season.

The disking operation raises the depression in the road ruts and allows standing water to spread evenly to adjacent porous ground. The natural porosity of the soil

[1]The opinions expressed in this article are those of the author and are not to be construed as reflecting the views of the Navy Department or the Naval Service at large.

[2]Department of Tropical Medicine, Naval Medical School, Naval Medical Center, Bethesda, Maryland.

Fig. 1. Road ruts. A favorite breeding place of *A. farauti* in the South Pacific.

Fig. 2. A recently disked road. This area looked somewhat like Fig. 1 before disking.

Fig. 3. An abandoned jungle road. Disked and overgrown with vegetation.

Fig. 4. The tractor drawn disk harrow.

is restored and allows for rapid ground absorption unless the depressions are too deep for the disk plates.

A spiked-tooth harrow drawn by jeep or weapons carrier proved effective in breaking up clumps in clay soils to provide an even surface for drainage.

The disked "jeep-trails" and unauthorized roads are soon overgrown by grass and vegetation and when fenced off with barbed wire or other artificial barriers they are no longer of any concern to the oil crews as persistent mosquito breeding areas.

Herms reported the use of the disk-harrow in the United States for the control of salt marsh mosquitoes breeding in the crevices of drying clay marshes. The practice of disking to eradicate anopheline breeding was introduced overseas in the early days of the Pacific war and is believed to be the first wide scale use in the field of malaria control.

The initial plowing with the disk-harrow may appear expensive, but the economy in man power and oil compensates for its use and thousands of acres of road ruts were disked on the military bases of the New Hebrides-Solomon Islands as an adjunct to malaria control activities.

Bibliography

Herms, W. B. and Gray, H. F., 1944. Mosquito Control. The Commonwealth Fund, New York.

SOME MOSQUITO CONTROL OPERATIONS IN MONMOUTH COUNTY, NEW JERSEY

By HARRY G. VANNOTE, Superintendent
Monmouth County Mosquito Extermination Commission

Fig. 1. A 75 acre hydraulic fill on an open salt marsh near Port-au-peck. Spoil pumped from the Shrewsbury River which bounds the marsh on the north; depth of fill 3 to 5 feet.

The fill was made in 1936. In the spring of 1937 shrinkage of the mud upon drying, opened cracks 2 to 4 inches wide extending to a depth of 12 to 14 inches. Heavy rainfall filled these cracks with water, and produced one of the most prolific mosquito breeding areas ever encountered during all the years of mosquito control in Monmouth County. A beehive of mosquitoes in every crack.

If arranged in a straight line, the total length of the cracks would have been nearly 50 miles.

The problem was solved, and mosquito breeding checked by scarifying the 75 acres of mud cracks with a disc harrow both lengthwise and crosswise in the fall of 1937, finishing up with a scraper to complete the filling in of the cracks and leveling off the fill, which transformed an intense mosquito breeding area into a useful tract of land.

Fig. 2. Reconditioning a mosquito control ditch on a Monmouth County salt marsh.

Fig. 3. One of the mechanized power-spraying trucks operated by the Monmouth County Commission.

DDT EMULSION FOR THE CONTROL OF CULICINE MOSQUITOES IN CISTERNS

R. P. HOLDSWORTH, JR.,[1] CHRISTIAN C. DEONIER,[2] AND Z. D. HARRISON[1]

In Key West, Fla., one source of drinking water is rain that runs off roofs into concrete cisterns. Many of these cisterns have been abandoned and are now prolific sources of culicine mosquitoes, especially *Culex quinquefasciatus* Say and *Aedes aegypti* (L.). These abandoned cisterns were used for testing the effectiveness of various concentrations of DDT (1-trichloro-2,2-bis (*p*-chlorophenyl) - ethane) against culicine mosquitoes.

The DDT was applied as an emulsion made from a concentrate containing 20 percent of DDT, 60 percent of xylene, and 20 percent of *Triton X-100* (an aralkyl polyether alcohol). The applications were made by mixing the concentrate with about a gallon of water from the cistern

[1]Lieutenant, U.S.N.R.
[2]Entomologist, U.S.D.A., Agr. Res. Adm., Bureau of Entomology and Plant Quarantine, working under a transfer of funds, recommended by the Committee on Medical Research, from the Office of Scientific Research and Development to the Bureau of Entomology and Plant Quarantine.

TABLE 1. Effectiveness of various DDT emulsions against culicine mosquitoes in cisterns at Key West, Fla.

Concentration of DDT	Cistern		Date of Treatment	Weeks Effective
	Surface Area	Depth		
P.p.m.	*Square Feet*	*Feet*	*1943*	*Number*
5	80	1.0	Dec. 15	31[1]
	144	1.0	Nov. 2	37[1]
	90	3.5	Dec. 14	31[1]
	45	2.0	14	31
	144	1.0	15	31[1]
	100	.5	15	19[2]
2	100	1.0	15	17[2]
	108	1.0	Nov. 2	17
	120	2.0	Dec. 14	14
	140	1.0	14	14
	80	1.0	15	14
1	52	1.5	15	31[1]
	88	2.5	14	15
	70	2.0	Nov. 2	37
	30	2.5	Dec. 14	31
	48	1.5	15	17
	130	1.0	Nov. 2	37
	48	4.0	2	14
.1	228	2.5	Dec. 15	13
	96	4.5	15	21[3]
.05	120	3.5	15	3
	100	2.0	14	5
	150	1.0	14	3
	140	1.0	Nov. 2	Initial kill only
	80	.5	2	
	120	3.0	2	
.025	90	3.5	2	No control
	210	2.0	Dec. 15	Initial kill 100 per cent
	70	2.0	15	
	100	2.0	14	
	60	3.5	14	

[1]Treatment still effective on July 1, 1944, when the experiment was terminated.
[2]Cistern dry.
[3]Pupation prevented for 9 weeks after fourth instars appeared.

being treated, and stirring in the resulting emulsion.

The various concentrations of DDT were tested for both initial kill and residual effect, and the insecticide was considered to have lost its residual effect when living fourth-stage larvae were found.

Although 31 cisterns were used, this number is not considered sufficient to bring out the true variation in results that would be expected from an experiment of this sort. The results are given in table 1. The final reading was made July 7, 1944, at which time the concentration of 5 p.p.m. was still effective.

Since the quantity of the concentrate required to give 1 p.p.m. is only 0.14 ml. per cubic foot, it was difficult to measure out the minimum dosages required for initial kill in some of the small cisterns.

In these tests it was observed that the treatments had no effect on continued oviposition. Since females are not repelled, they do not seek untreated places to oviposit. The eggs hatched and the newly hatched larvae succumbed to the DDT. As the effectiveness of the DDT decreased, a few late instar larvae survived, but in one cistern, although fourth-instar larvae were numerous, no pupae were present until 9 weeks after the appearance of the mature larvae.

Many factors influenced the effectiveness of the treatments. Some of the cisterns were open, while others were covered. Many were full of trash. A few were highly polluted, and pollution undoubtedly affects dosage requirements. A highly polluted breeding place requires more DDT for initial kill, and a shorter residual control is obtained.

THE FINDING OF *ANOPHELES ALBIMANUS* WIED. AT WEST PALM BEACH, FLORIDA, (*Diptera Culicidae*)

ERNEST V. WELCH
Associate Entomologist, United States Public Health Service[1]

During a routine anopheline inspection at West Palm Beach, Florida, on August 19, 1943 a single female of Anopheles (Nyssorhynchus group) was found in an area adjacent to an airport by the author. The specimen was dead when collected, and was hanging in a spider web beneath a bridge, over a hyacinth covered canal. The specimen was compared with pinned museum speimens of *albimanus* and the wing and palpal markings were identical. Further comparisons were impossible because of the condition of the specimen, however, there could be little doubt of its identity. *Albimanus* is not native to Florida and it is presumed that this collection represents a chance importation since subsequent inspections in the area have failed to reveal additional specimens.

[1] From the office of Malaria Control in War Areas, Florida State Board of Health.

A PUMP INSTALLATION TO DRAIN A 300-ACRE SALT MARSH

By O. W. LAFFERTY, *Superintendent*
Cape May County (N. J.) Mosquito Extermination Commission, Cape May Court House, N. J.

Cape Island Creek, where it passes through Cape May City, was inclosed within a five-foot diameter pipe for a distance of approximately one-half mile. The change was made in 1929 by the City, after securing permission of the War Department to close the original tidal stream, which was approximately eighteen feet wide. The pipe was fitted with a tide gate at its outer end to prevent flooding of the 300-acre marsh at its inner end by incoming tides.

The pipe was too small to properly care for the drainage from the marsh, and its capacity was further reduced by installing it at an elevation so high that the upper portion of the pipe rarely carried any water. The design specified an invert elevation of -2.0 ft. at the upstream end and -2.5 ft. at the discharge end, but as constructed, the discharge end was found to be at -1.3 ft., or 0.7 ft. above the inlet end.

The city officials were requested to take remedial measures, but to no avail, and considerable mosquito breeding subsequently took place in the marsh and in a fresh-water swamp and pond at its upper end. Species involved included *Aedes sollicitans, Aedes cantator, Anopheles crucians,* and in the more fresh portions of the marsh, *Anopheles quadrimaculatus, Aedes vexans* and *Culex pipiens.*

In 1941 the Army established a camp on the edge of the marsh, and a mosquito trap operated by the Commission within the camp caught at times more than 100 *Anopheles quadrimaculatus* per night. Accordingly a plan for relief of the breeding was developed in collaboration with the New Jersey Agricultural Experiment Station. The principal features of the plan were the establishment of a bulkhead across the stream at the upstream end of the pipe; the installation of a pump to lift the water from the marsh over the bulkhead thereby elevating it and creating sufficient head to secure gravity flow through the pipe; the construction of a sump into which the marsh water might drain and from which it could be readily pumped; and the reconstruction of the main stream through the marsh for a distance of more than a mile. The specifications called for the installation of tide gates in the bulkhead to permit gravity operation when mosquitoes were not breeding, and the use of a 12-inch Fairbanks-Morse Vertical Lift Propeller Pump, driven by a 10 horsepower electric motor, and having a capacity of 3000 gallons per minute.

Because of the malaria hazard, the U. S. Public Health Service was interested in this area and in 1941 promised cooperation in the installation of the mosquito control structures. However, no construction was begun until 1943, when the Cape May County Board of Chosen Freeholders was prevailed upon to construct the pump and sump unit, on plans prepared by the County Engineer following the plan previously worked out but substituting concrete for wood.

In July 1945 the unit was placed in operation under the joint control of the County Engineer and the County Mosquito Extermination Commission. A few days later, a rainfall of 3½ inches flooded the marsh to a depth of 2 inches, representing approximately 16,335,000 gallons of water. The water level was drawn down to the marsh surface in the first 48 hours of pumping, and thereafter fell rapidly, 6 inches in the next 24 hours, 7 inches in the next similar period, and 24 inches in the next period, after which the pump was

Mr. O. W. Lafferty explains the operation of the Vertical Lift Propeller Pump at Cape May City.

automatically shut off by the control switch as the minimum elevation of -2.0 feet had been reached.

A similar rainfall, previous to the installation of the pump, would have resulted in the flooding of the marsh for a period of ten to fifteen days, with ample time for the emergence of a brood of mosquitoes.

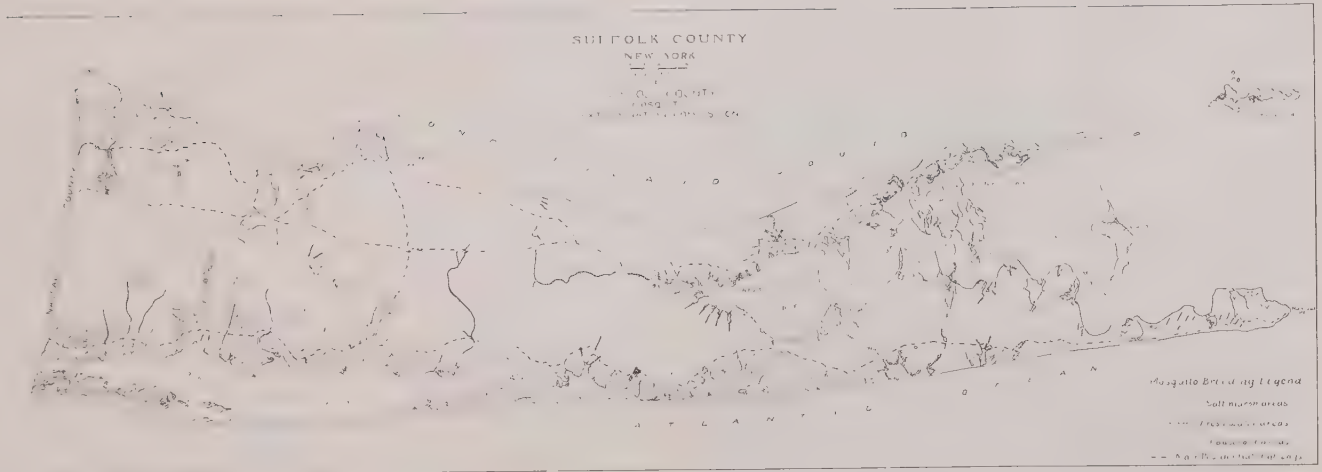


Fig. 1. Suffolk County has an area of 922 square miles, or 590,080 acres. Of this about 80,000 acres are mosquito breeding salt marsh, much of which is accessible only from the water. Up to five-eighths of a mill special tax is available for mosquito control work. Assessed valuation of county in 1945, $298,000,000.

MOSQUITO CONTROL IN SUFFOLK COUNTY, NEW YORK

By CHRISTIAN T. WILLIAMSON, *Director*
Suffolk County Mosquito Extermination Commission

Fig.-2. Headquarters at Yaphank. Offices and Shops.

Fig. 3. Storage tanks for oils and larvacide materials.

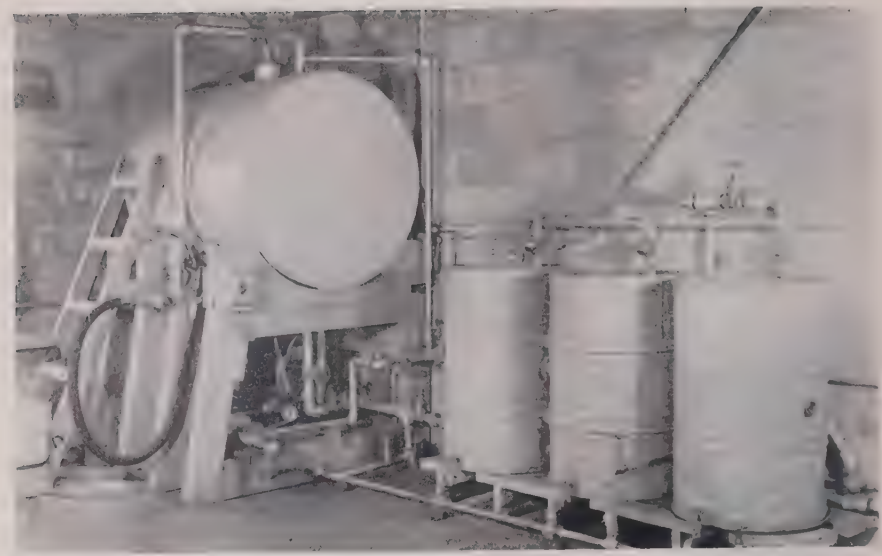


Fig. 4. Mechanical mixing equipment for preparation of stock larvacide.

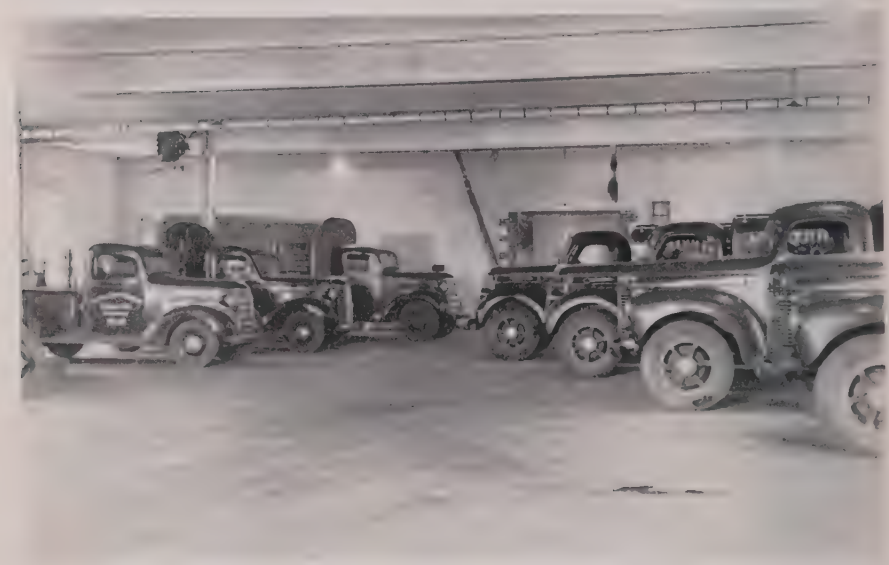


Fig. 5. Mosquito larvacide is delivered to supply stations for use by work parties, by tank trucks, or in drums delivered by smaller service trucks.

Fig. 6. Machine shop for servicing mechanized equipment.

Fig. 8. Smaller power boat, 28 feet long, enables the Director to keep in close touch with work at all times

Fig. 7. Larger power boat, 45 feet long, carries men and equipment to work areas inaccessible from main land.

Fig. 9. Approximately 40,000 acres have been sprayed four times with DDT in 1945 to kill adult mosquitoes before migrating from salt marsh areas. Two quarts per acre of a one percent solution of DDT in No. 2 fuel oil was used without any observable harm to fish or to other wildlife.

NEWS AND NOTES

A Letter to the Secretary

From Lt. Walter Abramitis, Sn.C., 0521028, 37 M.S. Det., APO 660, San Francisco, Calif.

1st October '45
Osaka, Japan

Hello Tommy

I received my membership card today and I want to thank you for taking care of it.

I'm just a bit busy cleaning up some of the breeding around our installations, and expect that in another few weeks as the weather gets colder I'll be able to forget mosquitoes—especially since I don't expect to be here next summer.

We have been finding some *Anopheles hyrcanus sinensis*, but not much since this place is quite a metropolis. We have been picking it up in ponds and lakes around temples as well as in the inner moat of the Osaka Castle.

Practically all our breeding of culicines is confined to artificial containers—especially in the anti-incendiary cement water containers of which there are thousands. The cemeteries have a lot of hollow rocks that hold water but fortunately they aren't close by. The other stuff is wooden vats, cans, etc., even bombed out toilets produce their share of "skeeters".

We are now becoming more concerned with the rat population and flea situation. This is a city of rats, alright. One hospital is right in the bombed out area the building is fairly lively at night with rats. We'll be doing a lot of trapping and carry out a bait program to reduce the rat population. My guess is that they number higher than the Jap population in the city.

I saw Capt. Jim Hart in Manila but not since then. If I ever get up Tokyo way, I'll surely look him up. Incidently, I ran in to Seraso—he has a unit here. He worked for the State Department. What ever happened to Capt. Tischler? I haven't heard of him since he was in Oro Bay, New Guinea. Did he per chance get home?

Speaking of home, I wish I knew when I'll make it. I hope it's due at least in February. One thing, I'll need plenty of replacements before then. Our 1st Sergeant went home today, next month two more are due to go and by December all the rest will be eligible. That's going to leave me darn near alone! At present we have 9 men and 2 officers.

We will shortly have to go on a half-day basis as the 6th Army (our boss) wants to devote 20 hours to education and athletics plus the usual military basics such as drill, marches, lectures on military courtesy and inspections.

How is Dr. Pepper these days? And how is Dr. Headlee? What gives with the "chicks" in the department?

The cold weather is setting in here and we are still in sun-tans. Some winter clothing was issued but the supply ran out before we got any so now we will have to wait for the next shipment whenever that will be. I've picked up a cold that I'm trying to shake off.

My arm is a bit sore from influenza vaccine shots so I'll close for now. One of these days I'll be dropping in saying "hello". In the meantime drop me a line.

As ever,

WALT.

A Letter to the Secretary

From Major Duncan E. Longworth, Sn.C., 1421 SW 8th Court, Fort Lauderdale, Florida, August 20, 1945

Dear Tom:

I have just returned from Africa and I think you had better change my address back to 75 Lee Avenue, Rockville Centre, N. Y. It can be forwarded to me from there, wherever I may be.

I had intended to write something for the "Mosquito News" but just never got around to it. I was quite busy the whole time at the Gold Coast. It is a delightful country and really the nicest place I have ever been stationed, the states included. There is plenty of work there for a malariologist, as well as most tropical diseases.

I was appointed malariologist for the African-Middle East Theatre about a month before I left. However, the Pacific intrigued me more and I succeeded in coming on with my unit, the 212th Malaria Survey Det. We are now enjoying our thirty day leaves, and were supposed to go the Pacific at the end thereof. However, we can hope that will be changed with the recent Pacific war news.

We did have a rather unusual steup at Accra, Gold Coast. An official Inter-allied Malaria Committee was set up with the American, RAF, British Army, and Civilian government as members. We operated as a separate organization and with officers and soldiers from the several outfits working together. My detachment performed all the malaria survey activites for an area of 80 square miles and were in charge of the Laboratory for the Committee. We had upwards of 300 natives on survey work and some 3000 on all activities. The natives are quite intelligent and we trained several as entomological and parasitological technicians, as well as draftsmen, clerks, etc.

Our work included almost everything in the book. We had three cub planes, one Stearman and a C-47 for airplane spraying and observation. We sprayed an average of 25,000 native and European homes a month with DDT. That's just a sample of the amount of work involved.

Please give my best regards to everyone and to yourself.

DUNCAN E. LONGWORTH.

DDT Conference and Demonstration in New York City—A conference and demonstration on DDT was held in New York, N. Y. on September 18 and 19, 1945 under the direction of the U. S. Public Health Service, Office of Malaria Control in War Areas. The conference was attended by 51 persons representing public health and allied departments of the City of New York and the States of Connecticut, Delaware, Maine, Massachusetts, New York, New Jersey, Rhode Island, and Vermont.

It was the purpose of this conference to supply these public health workers with reliable and practical information concerning the proper use of this insecticide in the control of insects of public health importance in this area. The agenda for the first day included lectures on the following phases of the problem:

1. Basic principles of DDT Application—Major H. L. Fellton.
2. Insects of Public Health Importance —Capt. R. C. Barnes.
3. Preparing DDT mixtures, Solutions and Emulsions—Lt. H. M. Giges.
4. Application of DDT—Major H. L. Fellton.
5. Precautions in Handling and Applying DDT—Capt. R. C. Barnes.

All of the lectures were accompanied by appropriate illustrative material including demonstrations of materials and equipment, film strips, and movies.

On the second day, demonstrations of the preparation and application of DDT were presented. Specific demonstrations showed application of the residual spray for control of flies, mosquitoes, bed bugs, and cockroaches, and application of the dust for control of cockroaches. Following these demonstrations each member of the group was given the opportunity to practice the application of the sprays and dusts.

The meetings concluded with a round-table discussion and review.

R. C. BARNES

National Audubon Society Symposium on DDT and its Relation to Wildlife—Scientists from the Bureau of Entomology and Plant Quarantine, Fish and Wildlife Service, U. S. Public Health Service, U. S. Navy, State Experiment Stations and others discussed experimental work that

has been done on DDT, especially in relation to wildlife. This symposium was a part of the 41st Annual Convention of the National Audubon Society and was held in the auditorium of the New York Historical Society in New York City on October 22, 1945.

The program consisted of a series of short talks by the various specialists, after which a brief question and answer period was held. Dr. P. N. Annand, Chief, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture emphasized the responsibility of his Bureau in preserving the wildlife, mammals and forests, and that DDT is a tool to prevent destruction of our forests. He pointed out that DDT is no more toxic to the higher animals than the fluorides and the arsenicals which are now in common use as insecticides. He discussed briefly the experimental work which had been done by the Bureau in cooperation with other interested agencies, to determine the effect of large dosages of DDT on wildlife when sprayed on extensive areas of forest land. On the basis of present knowledge, the Bureau recommends a maximum of one pound of DDT per acre, which will not be harmful to wildlife, except to fish, where lakes are sprayed directly.

Dr. Annand emphasized that much more research work is necessary to determine the minimum lethal dosage and the effects of DDT on soil bacteria.

Further information on the experiments conducted with DDT on 14 forest areas throughout the United States was given by Dr. Clarence Cottam, Chief, Division of Wildlife Research, Fish and Wildlife Service, Department of the Interior, and Mr. Richard H. Pough, Research Associate of the Audubon Society.

Dr. Cottam stated that two pounds of DDT per acre seemed to have no appreciable effect on bird life, while almost all surface feeding fish were killed and the bottom feeders were left unharmed. Mr. Pough reported that forty-eight hours after a five-pound per acre dosage of DDT was sprayed on a wooded area by airplane, the woods were silent, and all birds were believed killed except hermit thrushes, hawks and some towhees. However, twelve days later many birds were back in the same experimental plot. Dr. Cottam noted that the one-pound per acre dosage of DDT had no harmful effects on the birdlife of the forest.

Dr. S. W. Simmons, Director, Carter Memorial Laboratory, U. S. Public Health Service, Savannah, Georgia, pointed out that DDT as it is being used by the Service will have no effect on bird life. The Public Health Service is using it mostly as a residual spray in buildings for control of insects of medical importance.

Dr. Robert D. Glasgow, New York State Entomologist, pointed out that the main reasons for alarm over the use of DDT are its residual effect, its power in small quantities to kill some forms of life, and a possible trend toward its application over extensive areas for insect control. He called for a balanced, scientific attitude in evaluating the results of its use.

The session was presided over by Mr. John Baker, President of the Audubon Society. Other persons who spoke, in addition to the ones previously mentioned, were as follows: Dr. Hopper, Bureau of Medicine and Surgery, U. S. Navy; Mr. L. W. Swift, U. S. Forest Service; Dr. E. F. Phillips, Professor of Entomology, Cornell University; Dr. C. H. Curran, Entomologist, American Museum of Natural History; Mr. Henry Reppa, Long Island State Park Commission; Mr. R. L. Vannote, Superintendent, Morris County, N. J. Mosquito Commission; Mr. F. P. Freeman, Mayor, Island Beach, New Jersey; Mr. L. G. McNamara, N. J. State Department of Conservation; and Dr. V. K. LaMer, Columbia University.

An evaluation of the data presented at the meeting pointed to the fact that DDT, if used with discretion and at recommended dosages would result in no harmful effects to bird life. However, DDT is somewhat more toxic to fish life. Many speakers stressed the need for further research on the subject of DDT and its effects on wildlife. C. A. WILSON

Donald MacCreary Released by Navy—Mr. Donald MacCreary, Associate Research Professor of Entomology, University of Delaware, after more than three years of active duty as Lt. Commander, U. S. Naval Reserve, serving both in this country and in South America, returned to his former position on October 15, 1945.

L. A. STEARNS

Committee on Field Trip Arrangements—Following the meeting of the Executive Committee in Baltimore in mid-September, President Ruth appointed a committee consisting of Dr. F. C. Bishopp, Chairman; H. H. Stage, H. L. Fellton and Miss Helen Louise Trembley to make the necessary arrangements for an American Mosquito Control Association field trip in the Washington, D. C. area. H. L. F.

Nicholson Transferred—Lt. H. P. Nicholson, Malaria Control in War Areas, USPHS, was transferred recently from Norfolk, Va. to the Carter Memorial Laboratory, Savannah, Ga. H. L. F.

Osmun Promoted—John V. Osmun, Entomologist, Second Service Command, Governors Island, N. Y. has been promoted to the rank of Captain. H. L. F.

Russell Transferred—Dr. A. E. Russell, for several years Liaison Officer from the U. S. Public Health Service to the Second Service Command, has been relieved from that assignment and transferred to the U. S. Quarantine Station, Rosebank, S. I.

H. L. F.

Fred L. Hayes Gone—We regret to report the death of Fred L. Hayes, Superintendent of the Dr. Morris Mosquito Abatement District at Bakersfield, California, of pericarditis on October 16, 1945. He had been ill for about a year. He was one of the oldest and best liked of the district superintendents in California. In 1938 he was President of the California Mosquito Control Association. He was an excellent practical experimenter and developed several types of mechanized equipment especially suited to the peculiar terrain in his district. H. F. GRAY

A New Mosquito Abatement District—The Turlock Mosquito Abatement District has just been organized in Stanislaus County, California, comprising an area of 360 square miles in the southern part of the county east of the San Joaquin River. It is expected to start operations in 1946.

H. F. GRAY

California Mosquito Control Association—It is anticipated that a meeting of the California Mosquito Control Association will be held sometime in January, 1946. It has been requested that an entire day be set aside for a joint meeting with health officers, for reports on practical experience with DDT during 1945.

H. F. GRAY

Requests for Another Course on Mosquito Control—Several requests have been received by the School of Public Health, University of California, Berkeley, to present another course on Mosquito Control. Unfortunately, it is probable that the conduct of such a course will not be possible until perhaps toward the end of 1946.

H. F. GRAY

Educational Mosquito Control Conference in South Jersey.

For many years, twelve of the twenty-one counties in New Jersey have had County Mosquito Extermination Commissions actively engaged in mosquito control. In 1945, the activation of county programs in Somerset and Mercer counties brought the total number of commissions to fourteen.

However, in some counties, particularly in the southern part of the state where no substantial mosquito control work has been done, there is a great deal of mosquito annoyance, and malarial mosquites are also present, though in smaller numbers than the pest forms.

The demands of the people and the civic bodies in these counties for mosquito control work have been increasing, and as a public service to the people, the Camden Courier and Post newspapers have carried in their columns during the past three years

a series of educational articles to indicate how mosquito control might be had in the South Jersey communities which do not now have such protection.

Largely through the efforts of these newspapers, in cooperation with the N. J. State Federation of Women's Clubs and the New Jersey Mosquito Extermination Association, the conference, the program of which is printed below, was held.

The attendance numbered 75 persons, and the information presented showed that the work of the presently active county commissions has been very effective in reducing malarial and pest mosquitoes, there is a demand for the extension of the mosquito control work to include the unprotected sections of the state, there is legal provision for the organization of commissions in the counties which do not now have them, and it is practicable to provide at reasonable cost for the reduction of pest and malarial mosquitoes in these areas.

In the few weeks that have elapsed since the conference was held, one new commission has been appointed, and two previously inactive commissions have been reactivated. These three commissions, in Salem, Cumberland and Burlington counties, plan to begin active field work in 1946.

The program of the meeting follows:

Invitation and Program

Auspices of N. J. Federation of Women's Clubs, N. J. Mosquito Extermination Association, Courier-Post Newspapers, held at Walt Whitman Hotel, October 31, 1945.

Visualizing the important public service of mosquito control, the undersigned have joined to bring about the desirable objective of complete control of mosquitoes in South Jersey counties. This is, of necessity, a cooperative undertaking in which every county is asked to join with its neighboring counties. In short, we are asking you to cooperate in having your county become a part of this good neighbor policy on mosquito control.

Mosquitoes, malaria-carrying or pest, do not respect county borders. So that the work, now under way, in some counties will not be offset or minimized in results by lack of any control in a neighboring county, we seriously invite your interest and attention to *sending one or more persons to represent your organization or public body at this conference.*

Facts you should know as to *why* this conference, follow:

1. Malaria mosquitoes are fairly generally distributed in the Southern New Jersey counties of Burlington, Camden, Gloucester, Salem, Cumberland, and in lesser degree in Cape May and Atlantic.

2. Malaria outbreaks, due to presence of these mosquitoes and return of servicemen who have suffered the malady (which is recurrent in the malaria victim for periods as high as 10 years) are considered as most likely during the years of 1946 and 1947. Camden county had an epidemic of 120 cases as recent as 1935-36.

3. This is not cause for alarm, but is cause for precaution.

4. Malaria and pest mosquitoes can be controlled at relatively small expense with every municipality and county willing to do its share.

5. The pest mosquito despite great strides and progress in control, is a tremendously big problem in South Jersey counties with deletorious effects upon general comfort of the people during summer months, upon agriculture and resort business. It is practicable to obtain satisfactory and permanent control over the pest mosquito.

The what ,why, where and how of mosquitoes and their control will be fully covered at this conference by medical and control authorities. Motion pictures also will be shown.

As a contribution toward the public health of your community, may we urge you to attend, ask any questions you wish, and support the worthy objective of this undertaking?

This invitation has gone to the following, each of whom is asked to send one or more representatives:

Board of Chosen Freeholders of the seven South Jersey counties, Municipal governing bodies in all seven South Jersey counties, Rotary Clubs, Kiwanis Clubs,

Women's Clubs, Business and Professional Women's Clubs, American Legion Posts, Veterans of Foreign Wars, Visiting Nurses Associations, County Medical Societies, County Boards of Agriculture Soil Conservation Committees, Lions Clubs, Exchange Clubs, P-T Associations, American Association of University Women Chambers of Commerce, Sorptimist Clubs, Boards of Trade, County Farm Agents, District Officers, State Department of Health.

Conference Committee: Mrs. J .Alonzo Williams, chairman, N. J. Federaiton of Women's Clubs, Mosquito Department; Bennett E. Tousley, preisdent, N. J. Mosquito Extermination Association, Walter R. Batezel, editorial staff, Courier-Post Newspapers.

October 31, 1945—Morning Session, 10 to 12:30 p.m.

Afternoon Session, 2 to 4:30 o'clock.

Main Ballroom

Introduction—Mrs. J. Alonzo Williams, chairman of conference. Address of Welcome—Mayor George E. Brunner. Representing Courier-Post—Frank H. Ryan. Representing N. J. Mosquito Extermination Association—Bennett E. Tousley. Representing Women's Clubs—Mrs. J. Alonzo Williams.

"United, Uniform Mosquito Control in South Jersey," Bennett E. Tousley, president, N. J. Mosquito Extermination Association—10 minutes.

Film—"Mosquito Control"—15 minutes.

"The Women's Clubs' Interest in Mosquito Control," Mrs. John Hilton, chairman, Mosquito Control Committee, N. J. Federation Women's Clubs—10 minutes.

"History of Mosquito Control in South Jersey," Dr. Thomas J. Headlee, Professor Emeritus of Entomology, Rutgers University—10 minutes.

"Mosquito Control — An Economical Public Service," Dr. William H. Martin, Director of N. J. Agricultural Experiment Station—10 minutes.

"Recent Developments in Mosquito Control," Perry W. Smith, president, American Mosquito Control Association—10 minutes.

"The Efficiency of the Commission Form of Mosquito Control," Fred A. Reiley, superintendent, Atlantic County Mosquito Extermination Commission—10 minutes.

"The Future in Mosquito Control in South Jersey," Thomas D. Mulhern, administrative assistant, New Jersey Agricultural Experiment Station.

"A Plan for Mosquito Control Education in South Jersey," Walter R. Batezel, Courier-Post editorial staff—10 minutes.

"Benefits South Jersey May Expect from Efficient Mosquito Control," Dr. Bailey Pepper, chief, Department of Entomology, New Jersey Agricultural Experiment Station—10 minutes.

"Potential Malaria Hazards in South Jersey," Dr. J. Lynn Mahaffey, Director of Health, State of New Jersey—10 minutes.

Discussion by Capt. Homer Carney, Sanitation Officer, England General Hospital Atlantic City—10 minutes.

"The Method of Appointing Mosquito Extermination Commissions," Hon. Frederic Colie, Justice of Supreme Court of New Jersey—10 minutes.

Status of Mosquito Control in South Jersey counties:

(a) Atlantic—Bennett Tousley, Atlantic County Mosquito Extermination Commission—10 minutes.

(b) Cape May—Richard E. Reeves, Cape May County Mosquito Extermination Commission—10 minutes.

(c) Cumberland—Dr. Joseph Lamb, Cumberland County Mosquito Extermination Commission—10 minutes.

(d) Salem—J. C. Kinahan.

(e) Camden—Walter G. Evans.

(f) Gloucester—Hugh L. Mehorter.

(g) Burlington—Francis C. Stokes, Burlington County Mosquito Extermination Commission.

(h) Ocean—Dr. Alan K. Brouwer, Ocean County Mosquito Extermination Commission.

Nassau County Superintendent Retires

Mr. Edward Butchard, formerly of Roslyn, Long Island, and now of Willow,

New York, has retired as Superintendent of District B (which comprises the north shore of Nassau County) of the Nassau County Mosquito Extermination Commission.

Mr. Butchard became an employee of the County of Nassau more than twenty-eight years ago. During these years he watched the work of mosquito control go through the various phases and has been instrumental in bringing many new methods of control to Nassau County. He has been a member of the Eastern Association of Mosquito Control Workers for several years.

All of us miss his cordial manner and wish him well and many years of continued health and happiness.

EDITORIAL SECTION

TREND TOWARD MECHANIZATION OF MOSQUITO CONTROL WORK ACCELERATED BY MANPOWER SHORTAGE AND MOUNTING LABOR COSTS

As never before, the war just over has focused official and public attention upon the importance of insect carriers of disease and their control.

Of such insect borne diseases, malaria in its aggregate world-wide effects has been called the most destructive disease of man; yet not until 1898 was it discovered that malaria is transmitted by mosquitoes. Because of its intractability, and its spectacular, and fearfully destructive epidemics, yellow fever had long been one of the most dreaded of human diseases; yet not until 1901 was it shown that yellow fever also is mosquito borne.

Following these discoveries, organized mosquito control work was first attempted about the beginning of present century.

Mosquitoes develop in quiet water. Suppression of mosquito breeding, therefore, could be accomplished by the elimination of mosquito breeding water through filling or draining, by treating such mosquito breeding water with larvacide poisons, or by covering it with a film of oil.

The flight range of adult mosquitoes emerging from neighboring untreated water, however, very early made it evident that effective control of these insects and of the diseases they may carry can be accomplished only by community action, through which the control measures must be applied not only throughout the area to be protected, but also throughout a surrounding protective zone as well.

Since this may involve work on the property of many private owners, special legislation has been devised providing for the organization of mosquito abatement districts administered by local mosquito abatement commissions with power to enter private property for the purpose of doing any work that may be required. In most cases, such mosquito abatement districts have been made co-extensive with the counties concerned, to avoid overlapping fiscal agencies.

At first, ditching was done with hand tools, and larvacides and oil were applied largely by hand; but rising labor costs, and the enormous areas of salt marsh and of upland swamp and marshland to be treated, made it imperative that mechanized equipment be substituted for hand labor wherever possible.

From the beginning, therefore, the trend has been toward mechanization; but the earlier available mechanized equipment was not well adapted to the work, and special mechanisms had to be devised, built, tested, and improved. Modern engineering equipment, however, is much better suited for use in mosquito control work, and was being rapidly adopted prior to 1929.

Now, after 15 years of depression enforced economies and of war restrictions, old equipment is largely worn out or obsolete, and general inventories are heavily depleted.

While this has been a serious handicap during recent years, it will enable mosquito abatement commissions to re-equip themselves with the most modern equipment and supplies that have been developed under the stress of war requirements.

Manpower shortages and mounting labor costs will sharply accentuate the trend toward mechanization, and mosquito control work will correspondingly be improved and made more economical.

As a special service, MOSQUITO NEWS hopes frequently to publish descriptions of interesting mechanized equipment which may have been worked out and tested by some of our many ingenious mosquito control engineers, for the information of

co-workers who may be wrestling with similar problems.

A period of unusual activity in this field is just opening. When you are sure that you have a good idea, it may save time and money for some one else if you will promptly pass it along.

Letters to the Editor Taken Literally

September 26, 1945.

Robert D. Glasgow
Editor, Mosquito News
The University of the State of New York
New York State Museum
Albany 1, New York

Dear Mr. Glasgow:

I offer this letter to readers of "Mosquito News", knowing that they will appreciate Lt. Gurin's keen sense of humor. I do hope that suggestions offered by readers of the "Mosquito News" will not conflict with military regulations.

Sincerely,

J. LYELL CLARKE
Sanitary Engineer

Enc. The DesPlaines Valley Mosquito Abatement District.
JLC:ef

September 21, 1945.

Oak Leaves
100 S. Marion
Oak Park, Illinois

Dear Sirs:

I want your readers to share our appreciation of the following letter:

" Myitkyina, Burma

"The Des Plaines Valley
Mosquito Abatement District

"Dear Sirs:

"Mosquitoes *DO* annoy me!

"LT. GURIN"

The above letter was prompted by the following ad which appeared in the August issues of Oak Leaves: If mosquitoes annoy you, please notify the Des Plaines Valley Mosquito Abatement District. Phone Lyons 6765. No charge will be made for the inspection of mosquito breeding places.

In response to this ad the mosquito abatement district received four complaints—three were from villages inside the district, and Lt. Gurin's Burma complaint, slightly beyond the present territorial boundaries of our district.

After mature consideration, we have arrived at the conclusion that Lt. Gurin is suffering from acute mosquito annoyance aggravated by a desire for home comforts.

A number of our employees have written Lt. Gurin reporting upon mosquito bites received (outside the district) and have requested him to send us Burma mosquitoes for our permanent collection. In order to facilitate capture and shipping of these Burmese vampires, we have sent him collection devices and packing boxes.

If readers of Oak Leaves wish to commiserate with him, or send him an atomic mosquito swatter, his address is as follows: Lt. Lawrence R. Gurin, 1332 AAF BN, APO 490, c/o P.M., New York, N. Y.

Sincerely,

J. LYELL CLARKE
Sanitary Engineer.

JLC:ef

REVIEWS AND ABSTRACTS

AIRPLANE APPLICATION OF DDT LARVICIDES. By C. C. Deonier and R. W. Burrell. Journal of Economic Entomology, Vol. 38, No. 4, pp. 425-427, Aug., 1945. Field tests were conducted by the authors to determine the feasibility of applying DDT as a larvicide for mosquito control by airplane. At first, DDT dust was applied, since airplanes equipped for dusting were available. Later, due to the development of a portable spray unit by Husman and Longcoy, DDT sprays were used in the tests. The spray unit is made up of a supply tank, propeller-driven pump, and an adjustable nozzle mounted on a venturi tube suspended beneath the plane at the center of gravity.

The experiments with DDT dusts were conducted in the rice-growing section of Arkansas and at certain areas in Florida. All the tests made with DDT sprays were conducted in Florida, and a cub airplane was used for all the experiments.

Results of the tests indicated that DDT dust could not be recommended for application by airplane because of undesirable physical properties of the dust. The particles of the dust tend to cling together. Due to the high toxicity of DDT, it was found feasible to apply the material as a spray. Results indicated that as little as one quart of 5 per cent DDT could be applied per acre by the use of the cub spray unit. Further work is being done on the minimum dosage of DDT necessary for satisfactory larval kills. Advantages of applying the DDT as a spray are: a greater pay load can be carried, greater accuracy of application accomplished, and application under more adverse weather conditions.

—C. A. Wilson,
Malaria Control in War Areas, USPHS.

LARVICIDAL AEROSOLS CONTAINING DDT. By Howard A. Jones, C. C. Deonier, R. W. Burrell and E. F. Knipling. Journal of Economic Entomology, Vol. 38, No. 4, pp. 432-433, Aug., 1945. Entomologists at the Orlando, Florida, Laboratory of the Bureau of Entomology and Plant Quarantine, U.S.D.A., formulated several types of liquefied-gas aerosols containing DDT, for testing as anopheline larvicides. Preliminary results are promising, and further experiments are being conducted to develop methods of applying them from the ground and from aircraft. Methyl chloride was substituted for Freon-12 (dichlorodifluoromethane) in some of the tests, since it is a better solvent for DDT. Use was also made of fatty acids in certain experiments to increase the nonwettability of the particles.

Three series of laboratory tests were run before field experiments were attempted. For the indoor tests a room of 40,000 cubic feet capacity was used, and the aerosol dispenser nozzle was placed about one foot from the floor level and directed toward the pans used. *Anopheles quadrimaculatus* Say larvae were used in all the laboratory experiments. In the first test three pans filled with water were placed 10, 20, and 30 feet from the cylinder containing the aerosol and 7.5 grams of DDT was released. Two hours later the pans were removed and 20 larvae were placed in each pan. All the larvae were dead 24 hours later. The second test was conducted the same as the first, except that 4 pans placed 30, 40, 50, and 60 feet from the cylinder were used. The dosage of DDT was reduced to 4.05 grams and the exposure time cut to one hour. Twenty-four hours later the larval mortality was 100 per cent.

Another indoor test was conducted to determine the resistance of the DDT aerosol deposit to artificial rain. A dosage of 6.0 grams of DDT was used and allowed to settle for one hour. Some of the jars were immediately given an artificial rain of 6 inches in 3 minutes, and two later rains. Other jars were subjected to one six-inch rain, in three minutes, after 3 days. Mosquito larvae were introduced at intervals after the aerosol treatment and mortality was determined 48 hours after introduction of the larvae. A dosage of 6.0 grams of DDT was adequate to give complete mortality at 60 feet without rain. One hundred per cent mortality after 8 days was noted in pans located 40 feet from the dispenser following the second rain. One jar 30 feet away showed 100 per cent mortality after a rain after 17 days and again 10 days later.

Field tests were conducted under natural field conditions in Florida. The DDT aerosols were applied from the ground and almost complete kills of *Anopheles crucians* Wied. larvae were obtained. The dosage used was 0.1 pound of DDT per acre, and it was applied to two ponds of 1500 and 9750 square feet in area.

—C. A. Wilson,
Malaria Control in War Areas, USPHS.

LA INGENIERIA ANTIMALARICA EN VENEZUELA. [Antimalarial engineering in Venezuela.] By Arturo Luis Berti, 1945. 34 pp., 12 illus., 3 graphs, 3 maps. A rather compact booklet, which gives the control by engineering methods of *Anopheles darlingi* Root and *A. albimanus* Wied., has been published recently in Venezuela. A most important phase of the work is the construction of canals. During a period of 8 years, 180 kilometers of canals were built in Venezuela. It was found to be more expedient to use portable equipment for the building of the concrete canals than to establish centers for such work. Antimalaria engineering methods are of much importance in this country where optimum conditions prevail for the breeding of mosquitoes. Engineers must be extremely cautious since excavations left unused soon become filled with water in which anophelines abound.

As a result of antimalaria engineering efforts in Venezuela, against *Anopheles darlingi*, the number of malaria cases in Cabudare dropped from 835 in 1939 to 5 in 1941; in Acarigua from 288 in 1940 to 5 in 1944; and in Maturin from 536 in 1940 to 23 in 1944. These cases are well summarized in a series of graphs at the end of the paper.

Antimalarial engineering methods were carried out also against *Anopheles albimanus* and in Marcay, prior to the control project, the cases of malaria numbered 930 a year. By 1940, however, this number was reduced to 0.—Helen Sollers, Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, U. S. Department of Agriculture, Washington, D. C.

LABORATORY REARING OF AEDES ATROPALPUS. By Helen Louise Trembley, Journal of Economic Entomology, Vol. 38, No. 3, pp. 408-409, June, 1945. Larvae of this species were collected from pot holes in rocks at Washington, D. C. and have been reared continuously since October, 1944. Standard rearing techniques previously described by the author for use with *Aedes aegypti* were generally followed in rearing *Aedes atropalpus*.

It was found that high humidity favors the longevity of adult *Aedes atropalpus*. Emergence, mating, feeding, and oviposition was accomplished in cages varying in size from 10 x 10 x 10 inches to 2 x 2 x 2 feet. Foods used with success were, ground dog food, powdered dog food, and whole oats cut in half for larvae. Tap water was used for the larval rearing. Adults were fed on sliced apple or dextrose solution. Oviposition was observed as early as two days after a blood meal, and approximately 100 eggs were deposited by each female. Eggs hatch in about 24 hours, pupation occurs at from 9 days to 2 weeks, and adults begin to emerge in about 30 hours. Man, chick and white rat are all about equally acceptable for a blood meal. These were the only hosts tried.

—C. A. Wilson,
Malaria Control in War Areas, USPHS.

QUIETING MOSQUITO LARVAE. By John B. Gerberich, Journal of Economic Entomology, Vol. 38, No. 3, pp. 393-394, June, 1945. Good results in quieting mosquito larvae for study was obtained by the use of a 10 per cent solution of methylcellulose ("Methocel", trade name, made by Dow Chemical Company). Experiments for its use on mosquito larvae were suggested by reports of its quieting effects on Paramoecium. *Aedes aegypti* larvae were reared and used in all the tests. The larvae in the test groups were placed in dishes containing "Methocel" for 3 hours each day during their development. All the larvae survived the treatment, pupated, and produced normal adults. From the results of his work, the author concludes that "Methocel" is non-toxic and has no effect on the normal development, and that it is recommended as a suitable agent for use in quieting mosquito larvae.

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OCCURRENCE AND DISTRIBUTION OF MOSQUITOES IN MISSISSIPPI. By A. G. Peterson and W. W. Smith, Journal of Economic Entomology, Vol. 38, No. 3, pp. 378-383, June, 1945. The authors report the results of 3 years of intensive mosquito collecting at 22 war areas comprising 67 war establishments throughout the state. The collecting was done as an adjunct to U. S. Public Health Service, Malaria Control in War Areas activities. Mosquitoes were collected by the use of standard procedures including larval, light trap, biting and natural and artificial resting place collections. The paper reports that a total of 52 species are now known from the state, and one new record, *Aedes cinereus* Meig., was included. Notes are given on the larval habitats, abundance and distribution of each species.

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GENERAL BIBLIOGRAPHY

REFERENCES TO LITERATURE OF INTEREST TO MOSQUITO CONTROL WORKERS

H. H. STAGE

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Agricultural Research Administration
United States Department of Agriculture

ANONYMOUS. 1945. Cultivation of malarial parasites. Amer. Med. Assoc. Jour. 128 (16): 1167-1168, 6 refs.

---------- 1945. Filariasis (Wuchereria) with special reference to early stages. War Med. 7 (6): 377-384, 2 figs.

---------- 1945. Quinine from green bark. Sci. News Letter 48 (5): 67-68, 3 figs.

----------n.d. How DDT spray keeps malaria away. Pictorial folder issued by U. S. Pub. Health Serv.

---------- 1945. Dengue vaccine. Amer. Med. Assoc. Jour. 128 (14): 1026.

---------- 1945. Mosquito Larvae die. Sci. News Letter 48 (6): 85.

---------- 1945. Insect repellent research. Down to Earth (Dow Chem. Co.) 1 (2): 10-12, 2 figs.

---------- 1945. General Kirk reports on malaria effects. Natl. Malaria Soc. Jour. 4 (2): 114 and 121.

---------- 1945. Number of cases reported by State Health officers, January through April 1945 as compared with the data for the same period in 1939-44. U. S. Pub. Health Serv. Rpts. 60 (35): 1019-1021, 1 table.

ABERLE, S. D. 1945. Primate malaria. Natl. Res. Council, Div. Med. Sci. 171 pp., 12 pls. Washington, D. C. [Processed]

ALBUQUERQUE-SOARES, H. 1945. Moderna concepcion del tratamiento del paludismo, su cura y profilaxis. Med. Rev. Mex. 25 (484): 174-181.

ANDUZE, P. J. 1943. Estudios de entomologia medica en el estado Merida-Venezuela. La fauna Culicidiana—descripcion del *Culex (Culex) albertoi* n. sp. Bol. de Ent. Venezolana 2 (4): 189-196.

---------- 1944. *Aedes (Ochlerotatus) euiris* Dyar. Bol. de Ent. Venezolana 3 (3): 161-163, illus.

ANDUZE, P. J., and HECHT, O. 1943. *Aedes (Finlaya) upatensis* n. sp. Bol. de. Ent. Venezolana 2 (4): 185-188, illus.

BALL, E. G., ANFINSEN, C. B., GEIMAN, Q. M., MCKEE, R. W., and ORMSBEE, R. A. 1945. In vitro growth and multiplication of the malaria parasite, *Plasmodium knowlesi*. Science 101 (2630): 542-544, 3 tables, 5 refs.

BATES, M. and HACKETT, L. W. 1939. The distinguishing characteristics of population of *Anopheles maculipennis* in southern Europe. 7th Internatl. Cong. Ent., Berlin 1938, Trans., Med. and Vet. Ent. 3 (5): 1555-1569.

BEACH, F. A. 1945. "Angry" mosquitoes. Science 101 (2633): 610-611, 2 refs.

BECKMAN, H. 1944. Will returned-soldier malaria menace Wisconsin? Wis. Med. Jour. 43 (12): 1222-1228, 19 refs., 2 figs.

BICKLEY, W. E. 1945. The anal gills of mosquito larvae. Mosquito News 5 (1): 18.

BIRD, J. 1945. Malaria eradication by breaking the sporogonic cycle of the *Plasmodium*. Asoc. Med. Puerto Rico Bol. 37 (2): 56-57.

BOGEN, E. 1945. Buffer precipitation test for malaria. U. S. Bur. Med. and Surg. U. S. Nav. Med. Bul. 45 (1): 47-53, 1 table, 5 refs.

BOYD, W. S. 1945. Educational activities as related to the returning malaria carrier problem. Natl. Malaria Soc. Jour. 4 (2): 147-150.

BROWN, H. W. 1945. Current problems in filariasis. Amer. Jour. Pub. Health. 35 (6): 607-613, 3 figs., 1 table, 1 graph, 18 refs.

CALVERY, H. O. 1945. DDT is poisonous. (Tolerance level deemed necessary when it is used on human food.) Hoosier Hort. 27 (5): 67-69, 4 refs.

CAMERON, G. R. 1945. The toxicity of 2, 2-bis(*p*-chlorophenyl) 1,1,1-trichloroethane (DDT). Brit. Med. Jour. 4407: 865-871, 1 table, 3 figs., 7 refs.

CANTRELL, W., and JORDAN, H. B. 1945. New mosquito hosts for *Plasmodium gallinaceum*. Jour. Parasitol. 31 (1): 55-56.

CARPENTER, S. J. 1945. Anopheline surveys in the Fourth Service Command. Natl. Malaria Soc. Jour. 4 (2): 115-121, 1 fig., 2 tables, 5 refs.

---------- 1945. Collection records of *Culex tarsalis* in Army camps in the Southeastern States during 1942, 1943, and 1944. Jour. Econ. Ent. 38 (3): 404-406, 1 table, 6 refs.

----------, CHAMBERLAIN, R. W., and WANAMAKER, J. F. 1945. New distribution records for the mosquitoes of the Southeastern States in 1944. Jour. Econ. Ent. 38 (3): 401-402, 1 table, 3 refs.

CERQUEIRA, N. L. 1943. Lista dos mosquitos da Bolivia (Diptera, Culicidae). Inst. Oswaldo Cruz Mem. 39 (1): 15-36.

---------- 1943. Algumas espécies novas da Bolívia, e referência a três espécies de *Haemagogus*. Inst. Oswaldo Cruz Mem. 39 (1): 1-14.

CHRISTOPHERS, S. R. 1945. Structure of the *Culex* egg and egg-raft in relation to function (Diptera). Roy. Ent. Soc. London, Trans. 95 (2): 25-34, 4 pls.

CHWATT, L. J. Studies on the melanic variety of *Anopheles gambiae* in southern Nigeria. Jour. Trop. Med. and Hyg. [London] 48 (3): 51-55, 8 tables, 32 refs.

COGGESHALL, L. T. 1944. Malaria: a current and post war medical problem. Mich. State Med. Soc. Jour. 43 (8): 662-665.

COLLIER, J. M. 1944. A case of malaria acquired near Sydney, New South Wales. Med. Jour. Austral. 2 (9): 213-214, 2 refs.

COOPER, R. F. V. 1945. Algo sobre el DDT. Rev. Mens. B. A. P. 28 (329): 81-83.

COOPER, T., and WESSELS, A. L. 1945. Malaria aboard an LST. U. S. Bur. Med. and Surg. U. S. Nav. Med. Bul. 45 (1): 54-56, 1 fig.

CORRADETTI, A. 1940. Le conoscenze sulla distribuzione delle specie *Anofeliche* nell'Africa Orientale Italiana. Riv. di Biol. Colon. 3 (6): 419-429.

COULSTON, F., CANTRELL, W., and HUFF, C. G. 1945. The distribution and localization of sporozoites and pre-erythrocytic stages in infections with *Plasmodium gallinaceum*. Jour. Infect. Dis. 76 (3): 226-238, 19 refs., 5 tables.

COVELL, G. 1944. Notes on the distribution, breeding places, adult habits and relation to malaria of the anopheline mosquitoes of India and the Far East. Malaria Inst. India, Jour. 5 (4): 399-434, 1 map, 234 refs.

DARLING, B. 1945. Airplanes versus insects. Prog. Guide 9 (1): 29.

DE TERRA, H. 1945. Rainfall periodicity in relation to malaria and agriculture in the Near East. Science 101 (2634): 629-631, 6 refs., 1 fig.

DETINOVA, T. S. 1944. Sootnoshenie mezhdu razmeron samok *Anopheles maculipennis atroparvus* V. Thiel i stadiei razovitiia iaichnikov k momentu vylupleniia (Relation between the size of female *A. m. atroparvus* V. Thiel and the stage of ovary development at time of hatching). Med. Parasitol. and Parasitic Dis. 13 (5): 52-55, 2 figs., 2 tables, 1 ref.

DEWS, S. C., and MORGAN, J. H. 1945. Military aspects of malaria control in the Fourth Service Command. Natl. Malaria Soc. Jour. 4 (2): 105-108.

DODGE, H. R. 1945. Notes on the morphology of mosquito larvae. Ent. Soc. Amer. Ann. 38 (2): 163-167, 15 figs., 3 refs.

DUNHAM, G. C. 1945. Role of tropical medicine in international affairs. Science 102 (2640): 105-107.

EIDE, P. M., DEONIER, C. C., and BURRELL, R. W. 1945. The toxicity of DDT to certain forms of aquatic life. Jour. Econ. Ent. 38 (4): 492-493.

ETHERINGTON, D. 1944. Fertilization of *A. maculipennis labranchiae* in the laboratory. Nature [London] 158 (3915): 608.

FAIRLEY, N. H. 1945. Medicine in jungle warfare. Roy. Soc. Med. Proc. 38 (5): 195-197.

FARNER, D. S. 1945. A new species of *Aedes* from the Caroline Islands. Biol. Soc. Wash. Proc. 58: 59-61.

FENG, LAN-CHOU. 1939. The geographical distribution of mosquitoes in China. 7th Internatl. Cong. Ent., Berlin 1938, Trans. Med. and Vet. Ent. 3 (5): 1579-1588.

FIROVED, J. W. 1944. Filariasis: public health aspects and prognosis. Ill. Med. Jour. 86 (2): 97-99, 3 refs.

FOWLER, C. D. 1945. A malarial study on island X in the Pacific. Fulton County [Georgia] Med. Soc. Bull. 19 (8): 7-9.

GARNHAM, P. C. C. 1945. Malaria epidemics at exceptionally high altitudes in Kenya. Brit. Med. Jour. 4410: 45-47, 3 tables, 6 refs.

GERBERICH, J. B. 1945. Quieting mosquito larvae. Jour. Econ. Ent. 38 (3): 393-394, 1 table.

GINSBURG, J. M. 1945. Toxicity of DDT to subsurface-feeding species of mosquitoes. Jour. Econ. Ent. 38 (4): 494-495.

GLAGOLEVA, E. M. 1944. Data on the ecology of *Anopheles* larvae in Tadjikistan. 3. Biotopes of *A. bifurcatus* and their chemism. Med. Parasitol. and Parasitic Dis. 13 (5): 47-52, 3 tables, 21 refs.

GOLDBERG, L., DE MEILLON, B., LAVOIPIERRE, M. 1944. Relation of 'Folic Acid' to the nutritional requirements of the mosquito larva. Nature [London] 158 (3915): 608-610, 7 refs.

GOMEZ-MARCANO, A., and CAPRILES, A. 1944. Esplenomegallia y parasitemia en la malaria. Tijeretazos sobre Malaria. [Venezuela] 8 (6): 93-103.

GOOD, N. E. 1945. A list of the mosquitoes of the District of Columbia. Wash. Ent. Soc. Proc. 47 (6): 168-179, 1 table, 12 refs.

GORDON, W. M., and GERBERG, E. J. 1945. A directional mosquito barrier trap. Natl. Malaria Soc. Jour. 4 (2): 123-125, 1 fig.

GRUNDY, J. H. 1945. A list of *Anopheles* concerned with transmission of disease in man. Trop. Dis. Bul. 42 (7): 517-525, 1 map, 34 refs.

GUTTMAN, S. A., PORTER, H. R., HANGER, F. M., MOORE, D. B., PIERSON, P. S., and MOORE, D. H. 1945. Significance of cephalin-cholesterol flocculation test in malarial fever. Jour. Clin. Invest. 24 (3): 296-300, 1 fig., 4 tables, 17 refs.

HAAS, V. H., FELDMAN, H. A., and EWING, F. M. 1945. Serial passage of *Plasmodium gallinaceum* in chick embryos. U. S. Pub. Health Serv. Rpts. 60 (21): 577-582, 4 tables, 1 fig., 1 ref.

HACKETT, L. W. 1945. News and notes. Mosquito News 5 (1): 19.

HALE, F. C. 1945. Developments in military insect control. Ind. State Bd. Health, Monthly Bul. 48 (6): 131-132, 146, 3 figs.

HAMMON, W., REEVES, W. C., BENNER, S. R., and BROOKMAN, B. 1945. Human encephalitis in the Yakima Valley, Washington, 1942. Amer. Med. Assoc. Jour. 128 (16): 1133-1139, 5 tables, 2 charts.

----------, REEVES, W. C., and GALINDO, P. 1945. Epizoology of western equine type encephalomyelitis: eastern Nebraska field survey of 1943 with isolation of the virus from mosquitoes. Amer. Jour. Vet. Res. 6 (20): 145-148.

HECHT, O., and ANDUZE, P. J. 1944. Contribucion al conocimiento de la fauna Culicidana de la part norte de la Guayana Venezolana. Bol. de Ent. Venezolana 3 (3): 105-118.

HOFFMANN, W. H. 1939. Das Finlay-Institut und die Gelbfiebermücke. 7th Internatl. Cong. Ent., Berlin 1938, Trans. Med. and Vet. Ent. 3 (5): 1589-1603, illus.

HU, S. M. K. 1944. Studies on the susceptibility of Shanghai mosquitoes to experimental infection with *Microfilaria malayi* Brug. VII. *Culex fuscanus* Wiedemann. Chinese Med. Jour. 62 (3): 255-259, 2 tables, 6 refs.

HUDSON, E. H. 1945. Quinine and atabrine—development and present application. U. S. Bur. Med. and Surg., U. S. Nav. Med. Bul. 45 (1): 57-70, 1 fig., 1 table.

HUFF, C. G., and COULSTON, F. 1944. The development of *Plasmodium gallinaceum* from sporozoite to erythrocytic trophozoite. Jour. Infect. Dis. 75 (3): 231-249, 2 pls., 67 refs., 1 table.

HUFFAKER, C. B. 1945. News and notes. Mosquito News 5 (1): 19.

HYMAN, A. S. 1945. Clinical masquerades of malaria. U. S. Bur. Med. and Surg., U. S. Nav. Med. Bul. 45 (2): 287-303.

IYENGAR, M. O.T. 1944. Problems relating to malaria control in Deltaic Bengal. Malaria Inst. India, Jour. 5 (4): 435-447, 6 tables, 6 refs.

JAYEWICKREME, S. H. 1944. Laboratory study on the larvicidal action of a mineral oil larvicide with some observations on the probable effect of field conditions. Malaria Inst. India, Jour. 5 (4): 467.

JOHNS, E. 1945. DDT approaching merchandising phase. Printers' Ink. 211 (4): 19-20, 96, 97, 4 figs.

JONES, H. A., DEONIER, C. C., BURRELL, R. W., and KNIPLING, E. F. 1945. Larvicidal aerosols containing DDT. Jour. Econ. Ent. 38 (4): 432-433, 1 table, 2 refs.

JONES, R. W. 1945. Report on use of a diaphragm pump and tide gates on malaria control project at Harvey Point, N. C. Natl. Malaria Soc. Jour. 4 (2): 99-104.

KELLNER, A., HOCHSTEIN, E., and TILLMAN, A. J. B. 1945. Spontaneous rupture of the spleen in malaria. Amer. Med. Assoc. Jour. 128 (17): 1227-1229.

KITZMILLER, J. B. 1945. *Orthopodomyia alba* in Kentucky. Jour. Econ. Ent. 38 (3): 409.

KNIPLING, E. F. 1945. The development and use of DDT for the control of mosquitoes. Natl. Malaria Soc. Jour. 4 (2): 77-92, 8 tables, 23 refs.

KNOWLES, F. L., and FISK, F. W. 1945. DDT water emulsion in rice fields as a method of controlling larvae of *Anopheles quadrimaculatus* and other mosquitoes. U. S. Pub. Health Serv. Rpts. 60 (35): 1005-1009, 9 tables, 11 figs., 3 refs.

KORCHAGINA, K. A. 1944. On the phenology of *Anopheles maculipennis messeae* Fall. in Bashkiria. Med. Parasitol. and Parasitic Dis. 13 (5): 62-71, 12 tables, 9 figs.

KRUSE, C. W., and GARTRELL, F. E., 1945. The use of house mosquito-proofing as an emergency malaria control measure in the Kentucky Reservoir. Natl. Malaria Soc. Jour. 4 (2): 133-146, 2 figs., 3 tables, 6 refs.

LAPAGE, G. 1945. Parasites and war. Mil. Surg. 23-29.

LAWSON, C. W. 1945. Malaria. Jour. Lancet 65 (7): 241-243, 4 refs.

LENERT, L. G., and LEGWEN, W. A. 1945. Construction and operation of a 4-inch hydraulic dredge for malaria control drainage. Natl. Malaria Soc. Jour. 4 (2): 93-98, 1 table.

LEVER, R. J. A. W. 1944. Entomological notes —6. New and less common mosquitoes of Viti Levu. Fiji Dept. Agr., Agr. Jour. 15 (1): 17-18.

LEVI-CASTILLO, R. 1945. *Anopheles pseudopunctipennis* in the Los Chillos Valley of Ecuador. Jour. Econ. Ent. 38 (3): 385-388, 3 figs.

---------- 1945. A new variety of the *Anopheles pseudopunctipennis* complex in Ecuador (Diptera, Culicidae). Mosquito News 5 (1): 17-18, illus.

LINDQUIST, A. W., SCHROEDER, H. O., and KNIPLING, E. F. 1945. Concentrated insecticides —preliminary studies of the use of concentrated sprays against houseflies and mosquitoes. Soap and Sanit. Chem. 21 (7): 109, 111, 113, and 119, 5 tables, 3 refs.

LIPPINCOTT, S. W., GORDON, H. H., HESSELBROCK, W. B., and MARBLE, A. 1945. Complement fixation in human malaria using an antigen prepared from the chicken parasite *Plasmodium gallinaceum*. Jour. Clin. Invest. 24 (3): 362-371, 9 tables, 2 figs., 8 refs.

LOMAX, J. 1945. The air permeability of mosquito netting. Textile Inst. Jour. 36 (3): T-60-T66, 4 tables, 4 figs.

LUBAR, G. 1945. New malaria drug cheap, to aid many. Washington Post, Aug. 26, p. 7B.

MACKIE, T. T., HUNTER, G. W., WORTH, C. B. 1945. A manual of tropical medicine, prepared under the auspices of the Division of Medical Sciences of the Philadelphia National Research Council. 727 pp., illus.

MANSON-BAHR, P. 1945. Cooperation in the war against disease. Nature [London] 155 (3942): 593-596.

MAPLE, J. D. 1945. The larvicidal action of DDT on *Anopheles quadrimaculatus*. Jour. Econ. Ent. 38 (4): 437-439.

MATHESON, R. 1945. Notes on *Anopheles occidentalis* D. & K. and *Anopheles quadrimaculatus* Say. Mosquito News 5 (1): 1-3, illus.

METCALF, R. L., HESS, A. D., SMITH, G. E., JEFFERY, G. M., and LUDWIG, G. W. 1945. Observations on the use of DDT for the control of *Anopheles quadrimaculatus*. U. S. Publ. Health Serv. Rpts. 60 (27): 753-774, 7 tables, 5 figs., 4 refs.

. . . . . and WILSON, C. E. 1945. The residual toxicity of the pyrethrins to *Anopheles quadrimaculatus:* Preliminary studies. Jour. Econ. Ent. 38 (4): 499, 1 table, 5 refs.

MILLER, D. 1944. Mosquitoes, malaria, and New Zealand. Cawthron Inst. Sci. Res., Forest Biol. Res. Sta. Pub. 60, 10 pp., 13 figs., 14 refs.

MILLER, E. M. 1945. Distribution of *Culex quinquefasciatus* Say in relation to salinity of water. Hawaii Ent. Soc. Proc. 12 (2): 229-230.

MISSIROLI, A. 1939. The varieties of *Anopheles maculipennis* and the malaria problem in Italy.

7th Internatl. Cong. Ent., Berlin 1938, Trans., Med. and Vet. 3 (5): 1619-1640, illus.

MITARNOVSKII, V. M. 1944. Smoking cigarettes for mosquito control. Med. Parasitol. and Parasitic Dis. 13 (5): 89-90.

MOORE, L. D. 1945. Incidence of malaria among troops in Liberia. Natl. Malaria Soc. Jour. 4 (2): 109-113, 2 tables.

NABOKOV, V. A. 1945. Anabasine sulfate: a protective agent against bites of malarial mosquitoes. Amer. Rev. Soviet Med. 2: 449-452.

NAPIER, L. E. 1945. The present status of antimalarial drugs. New England Jour. Med. 233 (2): 38-43, 15 refs.

NEUMANN, H. 1945. Filariasis in the white man. U. S. Army Med. Dept. Bul. 4 (2): 230-235, 1 ref.

ORR, L. W., and MOTT, L. O. 1945. The effects of DDT administered orally to cows, horses, and sheep. Jour. Econ. Ent. 38 (4): 428-432, 2 tables, 1 ref.

PAGE, S. G., and RISER, W. H. 1945. Suppressive treatment of malaria during combat operations. Va. Med. Monthly 72 (6): 255-257, 6 refs.

PARKER, W. V., and JOHNSON, H. A. 1945. A universal type concrete slab for precast ditch linings. U. S. Pub. Health Serv. Rpts. 60 (21): 582-587, 16 figs.

PELAEZ, D. 1945. Anofelinos de Mexico. I. Clave para la determinacion de las especies y subespecies, basada en los caracteres de las hembras adultas [Mex.] 6 (2): 69-77, illus.

PEREZ-MONTEO, F. 1945. Historia de la fiebre amarilla en Cuba. Rev. de Med. Trop. Parasitol., Bact., Clin. y Lab. 11 (½): 7-18, 142 refs.

PETERSON, A. G., and SMITH, W. W. 1945. Occurrence and distribution of mosquitoes in Mississippi. Jour. Econ. Ent. 38 (3): 378-383, 7 refs.

PICKUP, E. G. 1945. Education for malaria control. Jour. Health and Phys. Ed. [Washington, D. C.] 16: 312-314, 350, 8 refs.

PITTALUGA, G. 1945. Sobre un brote de "dengue" en la Habana. Rev. de Med. Trop. Parasitol., Bact., Clin. y Lab. 11 (½): 1-3, 2 graphs, 9 refs.

PRICE, M. M., and LYMAN, F. E. 1945. Second report on the control of *Anopheles quadrimaculatus* Say in the water-chestnut areas of the Potomac River, 1944. U. S. Pub. Health Serv. Rpts. 60 (34): 985-994, 2 figs., 4 tables, 1 ref.

RAEVSKII, G. E. 1944. Epidemiological interpretation of the fluctuation curve of mosquito population density. Med. Parasitol. and Parasitic Dis. 13 (5): 55-61, 10 figs.

RAKHMANOVA, P. I. 1944. Concerning variations in the ova of *Anopheles maculipennis sacharovi* Favre of the Tashauzskii region in Turkmenistan. Med. Parasitol. and Parasitic Dis. 13 (5): 91-92.

RAO, G. R. 1944. Malaria in the Jharia mining settlement Bihar. Malaria Inst. India, Jour. 5 (4): 471, 1 ref.

RIGDON, R. H., and RUDISELL, H., Jr. 1945. Effect of radiation on malaria. An experimental study in chick and duck. Soc. Expt. Biol. and Med. Proc. 58 (2): 167-170, 2 figs.

ROMAN, E. 1944. Un *Aedes* nouveau pour la France. Localites inedites de moustiques peu repandus (Diptera, Culicidae). Soc. Ent. de France Bul. 49 (2/3): 35-36.

ROSS, W. A. 1945. Some limitations of the new insecticide DDT. Pests 13 (8): 6, 8, 10.

ROUANET, G. VON. 1944. Einheimische malaria. Med. Ztschr. [München] 1 (2): 67.

RUSTOMJEE, K. J. 1944. Observations upon the epidemiology of malaria in Ceylon. Malaria Inst. India, Jour. 5 (4): 469-470, 2 refs.

SABIN, A. B., and SCHLESINGER, R. W. 1945. Production of immunity to dengue with virus modified by propagation in mice. Science 101 (2634): 640-642, 2 refs.

SAPHIR, W. 1945. Filariasis. Early clinical manifestations—an analysis of thirty-five cases. Amer. Med. Assoc. Jour. 128 (16): 1142-1144, 3 tables, 4 refs.

SCHOOF, H. F., SCHELL, S. C., ASHTON, D. F. 1945. Survival of anopheline larvae and pupae in muck. Jour. Econ. Ent. 38 (1): 113-114.

SEELER, A. O., MALANGA, C., and PIERSON, J. 1945. Effect of streptomycin on avian malaria. Soc. Expt. Biol. and Med. Proc. 58 (4): 291-292, 2 tables.

SIMMONS, J. S. 1945. DDT. Med. Rev. Mex. 25 (484): 75-81, 3 figs.

SIMMONS, S. W. 1945. Tests of the effectiveness of DDT in anopheline control. U. S. Pub. Health Serv. Rpts. 60 (32): 917-927, 1 table, 3 figs., 1 ref.

STABLER, R. M. 1945. New Jersey light-trap versus human bait as a mosquito sampler. Ent. News 56 (4): 93-99, 4 tables, 4 refs.

STARR, D. F. 1945. Use of a double-nozzled spray apparatus for the application of DDT or oils. Science 102 (2641): 156-157.

STIFF, H. A., and CASTILLO, J. C. 1945. A colorimetric method for the micro-determination of 2,2-bis (p-chlorophenyl) 1,1,1-trichloroethane (DDT). Science 101 (2626): 440-443, 2 tables, 1 graph, 6 refs.

STRICKLAND, E. H. 1945. Could the widespread use of DDT be a disaster? Ent. News 56 (4): 85-88.

SWELLENGREBEL, N. H. 1939. Die niederländischen Rassen des *Anopheles maculipennis* vom practischen standpunkt betrachet 7th. Internatl. Cong. Ent., Berlin 1938, Trans., Med. and Vet. Ent. 3 (5): 1675-1684.

TREMBLEY, H. L. 1945. Laboratory rearing of *Aedes atropalpus*. Jour. Econ. Ent. 38 (3): 408-409, 2 refs.

VAZ, Z., PEREIRA, R. S., and MALHEIRO, D. M. 1945. Calcium in prevention and treatment of experimental DDT poisoning. Science 101 (2626): 434-436, 2 tables, 4 refs.

VISWANATHAN, D. K., RAO, T. R., and RAO, T. S. R. 1944. The behavior of *Anopheles fluviatilis*. Part II. Nocturnal movements and daytime resting places and their bearing on spray-killing. tables, 8 refs.

WARD, T. G. 1945. Control measures against importation of disease by men returning from overseas duty. Amer. Jour. Pub. Health 35 (6): 572-574, 1 ref.

WATSON, R. B. 1944. Current concepts of malaria and its treatment. Memphis Med. Jour. 19 (9): 130-133.

WISECUP, C. B., BURRELL, R. W., and DEONIER, C. C. 1945. DDT sprays mechanically dispersed for control of anopheline mosquito larvae. Jour. Econ. Ent. 38 (4): 434-436, 1 table, 1 ref.

YOUNG, M. D., STUBBS, T. H., MOORE, J. A., and others. 1945. Studies on imported malarias: 1. Ability of domestic mosquitoes to transmit *vivax* malaria of foreign origin. Natl. Malaria Soc. Jour. 4 (2): 127-131, 5 tables, 1 ref.

ZELIGS, M. A. 1945. Psychosomatic aspects of filariasis. Amer. Med. Assoc. Jour. 128 (16): 1139-1142, 2 tables, 2 charts, 3 refs.

ZHUKOVA, N. N. 1944. Application of "K" preparation for mosquito control. Med. Parasitol. and Parasitic Dis. 13 (5): 93.

ZUKEL, J. W. 1945. Marking *Anopheles* mosquitoes with fluorescent compounds. Science 102 (2641): 157.

ZUMPT, F., and DINISSOWA, N. 1944. Versuche mit neuen *Anopheles*-Bekämpfungsmitteln. Ztschr. f. Hyg. Zool. Schädlingsbekämpf. 36: 81-95, 4 refs.

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